LAGENAE OF THE SOUTH-WEST PACIFIC OCEAN.

FROM SOUNDINGS TAKEN BY H.M.S. *WATERWITCH*, 1895.

By Henry Sidebottom.

(*Read March 26th*, 1912.)

Plates 14—21.

INTRODUCTION.

After the lamented death of my friend Mr. W. Blundell Thornhill, of Castle Cosey, Castle Bellingham, Ireland, his magnificent collection of Lagenae was presented to me by his widow, the understanding being that I should write an account of it.

This paper is the first instalment and deals with one set of gatherings only. The specimens are arranged on slides, each of which is divided into one hundred squares. Each set of gatherings has its own chart, showing the stations where the different forms were obtained, but it is not possible in the majority of cases to tell at which station each individual specimen was found, for they were not arranged with that object. Of course, where there is only a single example on a square, or when a form occurs at a single station only, there is no difficulty. This particular set occupies about 380 squares on the slides, each square representing a different species, or variety.

It would have been a delightful task to figure a greater number of the variations, if only with the object of showing how many of the so-called *species* run into each other; but this was impossible considering the amount of work that lay before

me. The localities and depths are copied from Mr. Thornhill's book of reference.

It was his intention to arrange all his Lagenae upon a fresh system, using only a very few specific names and introducing all the rest as variations. Among his papers are a couple of pages of manuscript, showing he was evidently commencing to put his ideas into order. The following passages occur: "Of course all forms are related to one another, and run into one another, but there is only one Lagena in many shapes and forms, just as there is only one House, but many forms and shapes of houses. For many reasons, it may perhaps be proved eventually that the shape of the test actually depends on some recognisable fact." Again: "Whether or not the depth at which these Lagenae were living has anything to do with it or not, one is struck by the great numerical superiority of the flattened species to the typically globular, and the comparative rarity of tests without striations, carinations or ornament of some sort."

I am greatly indebted to my friend Mr. Millett for his valuable advice, his unfailing courtesy and for entrusting to me the section **Lagena** of his monograph of the Foraminifera, into which he has copied drawings of all the known species.

My thanks are also due to Prof. Hickson, of the Victoria University, Manchester, for his kind assistance in selecting suitable names for many of the new forms.

No doubt my work is open to criticism, but with all its shortcomings I trust it will be acceptable to my co-workers, and will help to extend the interest in this particular genus of the Foraminifera.

H.M.S. "WATERWITCH." S.W. PACIFIC.

Nos.	Stations.	Localities and Depths in Fathoms.			
1.	157, 161, 168, 170.	18·57′ S. 179·44′ E.	fms. 1,818.	18·59′ S. 179·47′ E.	fms. 1,432.
		18·59′ S. 179·50′ E.	fms. 1,710.	19·3′ S. 179·55′ E.	fms. 1,600.

Nos.	Stations.	Localities and Depths in Fathoms.			
2.	159.	19·04′ S. 179·43′ E.	fms. 1,050.		
3.	180, 181, 183.	13·33′ S. 178·1′ W.	fms. 1,440.	13·18′ S. 177·50′ W.	fms. 1,250.
		12·49′ S. 177·29′ W.	fms. 1,880.		
4.	186.	12·21′ S. 177·10′ W.	fms. 1,730.		
5.	189, 192, 193, 200.	11·52′ S. 176·28′ W.	fms. 2,180.	11·28′ S. 175·47′ W.	fms. 2,290.
		11·54′ S. 176·03′ W.	fms. 2,275.	11·45′ S. 176·43′ W.	fms. 2,150.
6.	190.	11·26′ S. 176·27′ W.	fms. 1,985.		
7.	202, 205, 206.	10·59′ S. 176·36 W.	fms. 1,910.	11·40 S. 177·05 W.	fms. 2,042.
		11·55′ S. 177·18′ W.	fms. 1,989.		
8.	209.	12·18′ S. 177·38′ W.	fms. 525.		
9.	213.	12·30′ S. 177·53′ W.	fms. 1,595.		
10.	215.	12·15′ S. 177·44′ W.	fms. 1,455.		
11.	219.	12·22′ S. 117·39′ W.	fms. 541.		
12.	221.	12·35′ S. 177·38′ W.	fms. 620.		
13.	238.	12·44′ S. 178·09′ W.	fms. 1,050.		
14.	239.	12·55′ S. 178·13′ W.	fms. 1,630.		
15.	241.	13·22′ S. 178·38′ W.	fms. 1,475.		
16.	242.	13·42′ S. 178·47′ W.	fms. 822.		
17.	243, 245, 246.	13·55′ S. 178·56′ W.	fms. 1,115.	14·33′ S. 179·21′ W.	fms. 1,410.
		14·52′ S. 179·32′ W.	fms. 1,395.		
18.	248, 249.	15·24′ S. 179·46′ W.	fms. 1,472.	15·35′ S. 179·47′ W.	fms. 1,675.
19.	250.	15·43′ S. 179·43′ W.	fms. 820.		
20.	256.	16·9′ S. 179·47′ E.	fms. 505.		

Nos.	Stations.	Localities and Depths in Fathoms.			
21.	258, 260.	16·5′ S. 179·36′ E.	fms. 484.	16·7′ S. 179·28′ E.	fms. 533.
22.	264.	16·15′ S. 179·16′ E.	fms. 148.		
23.	275, 276.	18·57′ S. 177·36′ E.	fms. 1,195.	19·17′ S. 177·15′ E.	fms. 1,679.
24.	284.	25·03′ S. 171·37′ E.	fms. 2,310.		
25.	286.	26·27′ S. 170·17′ E.	fms. 2,033.		
26.	289.	28·30′ S. 168·23′ E.	fms. 1,745.		
27.	291.	29·00′ S. 166·50′ E.	fms. 1,950.		
28.	293.	29·2′ S. 163·59′ E.	fms. 1,225.		
29.	295.	29·3′ S. 162·24′ E.	fms. 710.		
30.	298, 300.	28·52′ S. 159·57′ E.	fms. 1,575.	28·53′ S. 158·6′ E.	fms. 1,612.
31.	301.	28·47′ S. 157·02′ E.	fms. 2,515.		
32.	302.	28·43′ S. 155·45′ E.	fms. 2,378.		
33.	303.	28·35′ S. 154·49′ E.	fms. 2,565.		
34.	304.	28·43′ S. 154·11′ E.	fms. 1,425.		

Where more than one station is indicated above, it shows that the samples have been mixed.

Family LAGENIDAE.

Sub-family **Lageninae.**

Lagena Walker and Boys.

Lagena globosa Montagu sp. (Pl. 14, figs. 1–6).

Serpula (*Lagena*) *laevis globosa* Walker and Boys, 1784, *Test. Min.*, p. 3, pl. 1, fig. 8.
Vermiculum globosum Montagu, 1803, *Test. Brit.*, p. 523.

In these gatherings, *Lagena globosa* is present in a great variety of forms. Besides the strictly globular, sub-globular, ovate and pyriform, there are specimens that run into *L. laevis* and *L. apiculata*. The internal tube, when present, often differs in character, and may be free or attached to the test. The orifices of the various forms also vary greatly. The tests are sometimes wonderfully transparent, thin and highly polished, at other times thick and opaque.

Pl. 14, fig. 1 is doubly entosolenian, orifice fissurine.

Pl. 14, fig. 2 is globular, and has the sides of the projecting mouth much flattened, causing the orifice to be a very narrow slit. There is a pinching in of the sides of the mouth at the centre, which apparently divides the orifice into two parts.—*Locality:* Uncertain.

Pl. 14, fig. 3 has a circle of projecting points surrounding the simple aperture. There is no internal tube. Very rare.—*Locality:* Uncertain.

Pl. 14, fig. 4 is globular, and has a hood in which the orifice is situated. I cannot give the exact locality for this globular form, but there is a variety, very similar, which occurs at many stations, the chief difference being that the test is slightly elongate, tapering towards the oral end, and so causing the hood to be less pronounced. A few are very slightly compressed.—*Locality:* Chiefly Nos. **30, 32.***

Pl. 14, fig. 5 is the compressed variety of fig. 4.—*Locality:* Chiefly Nos. **2, 17.**

Except that the tests are not partially carinate, these two

* Note.—The numbers throughout this work refer to my Chart on pp. 376–8, where will be found the official numbers of the stations with other particulars.

forms, figs. 4, 5, agree well with *L. ventricosa* Silvestri (1903) figs. 6*a–e*.

Pl. 14, fig. 6, has a band of clear shell-substance running round the test and orifice. Orifice fissurine. Only five found. There appears to be no internal tube.—*Locality :* Uncertain.

Lagena globosa Montagu sp. (Pl. 14, figs. 7–9, bilocular forms, figs. 7, 8).

I think there is no doubt that figs. 7, 8 represent *L. globosa* in the bilocular state, and they are interesting from several points of view.

There are only six recorded from these gatherings, but many more occur in the *Penguin* collection. Taking the two together one could arrange a complete series as regards size, from the smallest to the largest. In the smallest tests (single-chambered) fig. 9, a portion of the oral end appears to be solid except for the tubular passage through its centre, and the entosolenian tube is not always present. As regards these it is possible that they bear no relation to the bilocular examples, but they have every appearance of doing do. If I am right in my surmise it would appear that the animal had the power of expanding the solid portion at the oral end into a second chamber, and this would imply that it also increased the size of the initial chamber, for the second is never present in the smallest size. In the bilocular forms the solid portion is absent in both chambers.—*Locality :* Odd specimens only at Nos. **1, 3, 18, 28, 29, 30.**

Lagena globosa Montagu sp. var. nov. *maculata* (Pl. 14, figs. 10, 11).

Test globular or sub-globular, generally transparent, with four small, oval, opaque spots, placed equidistant from each other round the middle of the test, or slightly above the middle. Entosolenian, the tube being free and curiously coiled back upon itself. Aperture fissurine. Very rare.—*Locality :* Nos. **1, 32.**

Lagena globosa Montagu sp. var. nov. *annulata* (Pl. 14, fig. 12).

Test globular, entosolenian. A rather opaque band or ring surrounds the test near its base.

The tube is coiled back upon itself. The orifice is situated in a small depression. A solitary specimen.—*Locality :* No. **6.**

Lagena globosa Montagu sp. var. *emaciata* Reuss. (Pl. 14, figs. 13–15).

Lagena emaciata Reuss, 1862 (1863), p. 319, pl. 1, fig. 9.

There is present in these gatherings a very fine series of this elongate form of *L. globosa.* It occurs at many stations. There is a complete gradation of forms right up to fig. 14, which corresponds to *L. ovum.* As one would expect, several are pointed at the base, as in fig. 15. In figs. 13 and 15 the aperture is fissurine, and in fig. 14 it has three radiating fissures. The internal tube is straight and free. — *Locality :* Chiefly Nos. **19, 20, 29.**

Lagena apiculata Reuss. (Pl. 14, figs. 16–20).

Oolina apiculata Reuss, 1851, p. 22, pl. 1, fig. 1.
Lagena apiculata Reuss, 1862 (1863), p. 318, pl. 1, figs. 1, 4–8, 10–11.

Mr. Millett, in his Malay Report under this heading, remarks, " Bearing in mind that most, if not all, of the Lagenae have their apiculate condition, it seems unnecessary to endow each with a separate name ; but pending an entire reform of the classification, it may cause less inconvenience for the present if these names be retained." It is difficult to deal satisfactorily with the apiculate forms in these gatherings. One cannot in many cases draw a line of demarcation between the apiculate and non-apiculate forms, as they pass insensibly into one another. I am not sure, however, if some distinction may not have to be made when the apiculate portion is a tube, instead of being solid. I do not think the position, or nature, of the aperture, or the slight curving of the test sufficient to warrant the giving of a specific name. For those who take an opposite view there is a fine field open in these S.W. Pacific gatherings. Beautiful examples occur like those represented by figs. 16–18. I place them under this heading, but to me they seem to be as follows :

Pl. 14, fig. 16. A doubly ectosolenian, and entosolenian form of a typical *L. globosa.*

Pl. 14, figs. 17, 18. Entosolenian and ectosolenian variety of the same, the apiculate process being a tube in all three cases.—*Locality:* Odd specimens from a few stations.

There is a still larger specimen than fig. 17 with a longer projecting tube at the base, but it is not so globular in shape. There are also two fine apiculate, ovate specimens, one of which has a few subsidiary spines at the base of the test. Specimens from various stations occur similar to figs. 19, 20, the tube being long and slender, the orifice round and placed a little to one side. Some of the tests are asymmetrical like fig. 20, and a few are broader in relation to their height than the two figured.

Lagena apiculata Reuss var. nov. *punctulata*
(Pl. 14, figs. 21–23).

The contour of the test is subject to a good deal of variation; more generally the forms are like figs. 21, 23, but examples that are asymmetrical in outline occur, see fig. 22. Round in section, orifice usually fissurine, but sometimes with three radiating fissures. The whole of the test is covered with large pores. The entosolenian tube is straight and free. This handsome foraminifer may be allied to *Amphorina punctata* Seguenza (1862), pl. 1, fig. 39, and *L. apiculata* (Reuss) Terquem (1886), pl. 1, fig. 5. Most of the tests are pointed at the base, but a few are more or less rounded off.—*Locality:* It is marked to occur at six stations. Three were found at No. **9** and four at No. **18.**

Lagena ovum Ehrenberg sp.

Miliola ovum Ehrenberg, 1843, p. 166;—1854, pl. 23, fig. 2; pl. 27, fig. 1; pl. 29, fig. 45.

This is an unsatisfactory species. See remarks about fig. 14. Besides odd specimens that may be brought under this heading, there are a good number which may, or may not, be single chambers of a Nodosaria. They have a short internal tube, and a small ring at the base. Inside this ring the shell seems to be concave, has a granulated appearance, and may be porous. Some of the specimens are comparatively large, and tend at times to broaden out at the sides.—*Locality:* Chiefly Nos. **19, 21, 29.**

Lagena botelliformis Brady (Pl. 14, figs. 24–29).

Lagena botelliformis Brady, 1884, p. 454, pl. 56, fig. 6.

This again is to me an unsatisfactory species to deal with. Mr. Millett in his Malay Report considers it to be more nearly allied to *L. elongata* than to *L. globosa*. There is only one example that agrees with Brady's *Challenger* figure.—*Locality:* Uncertain.

Brady in his description of this form in the *Challenger* Report, p. 454, writes as follows: "Long, cylindrical, of even diameter, arcuate," but in his scheme of the Genus Lagena, also in the *Challenger* Report, it runs: "Cylindrical, or elongate, ovate, bent." I think therefore we may include such forms as I have figured. Chapman (1910), pl. 54, fig. 5, illustrates an example from material collected by H.M.S. *Penguin* near Funafuti, which is evidently of the same variety as those met with in these gatherings. I have also another large set of Lagenae, picked out of material collected by the *Penguin*, in which this variety is also frequent.

Pl. 14, fig. 24 is nearest to Chapman's figure, but the tests are more frequently similar to fig. 25. The aperture is placed at the bottom of a shallow hood.—*Locality:* It occurs at nearly all the stations, including Nos. **1, 17, 19, 21, 29.**

Pl. 14, fig. 26 is a very elongate variety.

Pl. 14, figs. 27, 28 appear to be weak, apiculate examples.—*Locality:* At No. **7,** one example; No. **11,** five; No. **14,** one.

Pl. 14, fig. 29, I take to be a slight variation of fig. 24. There are four sets of opaque, oval dots which run lengthwise, two rows on either side. The base is inclined to be pointed. It is very rare.—*Locality:* At No. **3,** one specimen; No. **23,** three.

Fornasini (1894), under the heading of *L. felsinea*, figures a form that appears to be very near to Chapman's and to my own fig. 24, the chief difference being that the aperture of his specimen is fissurine.

Lagena botelliformis Brady (?) var. nov. *rugosa* (Pl. 14, fig. 30).

Test cylindrical, curved, rugose. There is a short, tubular neck with a small "boss" at the end, in which the aperture is placed.

I cannot make out the nature of the shell-wall. The surface

is roughened, and it will be noticed that in the drawing the oral end of the test is partially eroded, and it looks as if the wall might be compound. I have placed it under the above heading provisionally.—*Locality :* No. **2**. A solitary specimen.

Lagena laevis Montagu sp.

Serpula (*Lagena*) *laevis ovalis* Walker and Boys, 1784, p. 3, pl. 1, fig. 9.
Lagena laevis (W. and J.) Williamson, 1848, pl. 1, figs. 1, 2.

They range from those having the body of the test globular, with either short or long neck, to those in which the body is subfusiform. These latter are apiculate, the process being a solid spine.—*Locality :* Various stations.

Lagena laevis Montagu sp. var. *distoma* Silvestri.

Lagena laevis (Montagu) Silvestri, 1900, p. 244, pl. 6, figs. 74, 75.

Locality : Occurs at a few stations.

Lagena gracillima Seguenza sp.

Amphorina gracilis Costa, 1856, p. 121, pl. 11, fig. 11.
Amphorina gracillima Seguenza, 1862, p. 51, pl. 1, fig. 37.

A single example only.—*Locality :* Either No. **19** or **20**.

Lagena elongata Ehrenberg sp.

Miliola elongata Ehrenberg, 1854, pl. 25, 1 A, fig. 1.

Only one occurs and it agrees very closely with Mr. Millett's illustration, Malay Report, 1901, pl. 8, fig. 10.—*Locality :* Either No. **19** or **20**.

Lagena aspera Reuss.

Lagena aspera Reuss, 1861, p. 305, pl. 1, fig. 5.

A single specimen, and it is similar to the *Challenger* figure, pl. 57, fig. 7, except that the body of the test is more elongate. The neck is broken.—*Locality :* No. **19**.

Lagena ampulla-distoma Rymer Jones.

Lagena vulgaris var. *ampulla-distoma* Ry. Jones, 1872, p. 63, pl. 19, fig. 52.

Many specimens are on the slide, and they show considerable variation both in the size of the test and the nature of the mam-

milate aperture. Specimens occur that are nearly smooth, and sometimes the lower half of the test is covered with short, blunted spines.—*Locality :* Chiefly Nos. **1, 2, 19, 22.**

Lagena hispida Reuss (Pl. 14, fig. 31, Pl. 15, fig. 1).

Sphaerulae hispidae Soldani, 1798, p. 53, pl. 17, v, x.
Lagena hispida Reuss, 1858, p. 434.

There are three very large specimens with the body of the test globular. The necks are long and decorated with short, blunt spines. One is apiculate.—*Locality :* No. **1.**

Many specimens similar to the *Challenger* fig. 2, pl. 57, are present, some of which are almost covered over with exogenous shell-growth, or a deposit of some description.—*Locality :* Many stations, but chiefly at Nos. **21, 29, 32.**

Pl. 14, fig. 31. There are numerous examples, globular and sub-globular. The entosolenian tube is long and straight. At the aboral end of the test the apiculate process is tubular, and often of considerable length. The examples are beautifully hispid; but in spite of the spines, the long, straight, entosolenian tube can be made out.—*Locality :* Five at No. **1**, and one or two at fifteen other stations.

Pl. 15, fig. 1 is round in section and apiculate, the circular orifice being sunk in a square, the corners of which end in spines that are curved downwards.—*Locality :* Two at No. **17** and one at No. **32.**

Lagena hispida Reuss, compressed variety (Pl. 15, fig. 2).

There are a large number of this compressed variety. The orifice is slightly phialine, and the test is bluntly apiculate. Many of the specimens are clogged with exogenous matter, and when in this state the fine, hair-like spines often project a considerable distance.—*Locality :* Chiefly Nos. **1, 3, 13, 17, 30, 32.**

Lagena hispida Reuss var. nov. *tubulata* (Pl. 15, figs. 3—5).

The test, besides being covered with long delicate spines (when in its perfect state) has strong tubular ones arranged symmetrically upon it, as shown in the drawings. The neck is long, sometimes bent.

Pl. 15, fig. 4 is the same; the spines are broken away. Many of the tests have the neck broken.—*Locality:* Five at No. **3**, two at No. **13**, five at No. **17**, and odd specimens at several other localities.

Pl. 15, fig. 5 is, I think, a variation. The long spines are much finer, and finish with a point when perfect, but when broken appear to be tubular. The neck gradually tapers to a point. The specimens are not in a good condition.—*Locality:* Chiefly Nos. **8, 11, 13, 17**, and one or two occur at a few other localities.

Lagena striata d'Orbigny sp. (Pl. 15, figs. 6–10).

Oolina striata d'Orbigny, 1839, p. 21, pl. 5, fig. 12.

I consider that the serial connection between *L. sulcata*, *L. striata* and *L. gracilis* is complete in these S.W. Pacific gatherings. *L. striata* is present in many beautiful forms and at many localities. The shape of the test varies from the globular to the cylindrical, and is often apiculate. The decoration of the tests is at times most delicate, and links up to *L. sulcata*. The beautiful spiral bands which often decorate their necks are sometimes of extreme fineness. Numerous examples range round *L. lyelli* Seguenza (1862), which is typically represented.

Pl. 15, fig. 6. There are about twenty-six of this small variety, the short neck of which is crowned with a minute "boss." The orifice is circular. The tests are generally round in section, but some are just a little compressed. At times, several of the costae are rather more prominent than the rest.—*Locality:* Chiefly Nos. **1, 3, 17**.

Pl. 15, fig. 7. In these, five of the costae, equidistant from each other, project more than the remainder.—*Locality:* Chiefly Nos. **19, 21**.

Pl. 15, fig. 8. This specimen has the apiculate process of extreme length.

Pl. 15, fig. 9, is the same as the *Challenger* figure, pl. 57, fig. 30, which Brady places under this heading. Only one occurs.—*Locality:* No. **20**.

Pl. 15, fig. 10. Seems to be another variant. One only occurs.—*Locality:* No. **30**.

Lagena striata d'Orbigny var. nov. *striatotubulata* (Pl. 15, figs. 11, 12).

Body of the test nearly globular, or ovate. Round in section. Numerous fine costae run lengthwise of the test, some of which do not reach as far as its base. Neck long, and provided with from four to six wings, starting part way up the neck, and reaching down to the middle of the test. In some cases they run down along the sides to join the long, projecting tubular processes at the base. The number of the tubular processes varies from four to six. Sometimes these tubes are flattened. There are a good number of this elaborate form; some are in perfect condition, but most of them are a good deal broken, and the adherence of debris interferes with their elegance. Brady's *Challenger* figure, pl. 57, fig. 29, appears to belong to this series, although it is probably a broken and poor example.—*Locality*: Chiefly No. **32**, and rarely at many other stations.

Lagena distoma Parker and Jones.

Lagena laevis var. *striata* Parker and Jones, 1857, p. 278, pl. 11, fig. 24.

There are only ten or eleven examples on the slide, although many more are indicated on the chart.—*Locality*: Chiefly No. **21.**

Lagena variata Brady (Pl. 15, fig. 13).

Lagena variata Brady, 1881, *Quart. Journ. Micr. Sci.*, N.S., vol. xxi., p. 61.

Lagena variata Brady, 1884, p. 461, pl. 61, fig. 1.

There are only two typical examples. They are irregular in shape.—*Locality*: One, No. **3**, the other uncertain.

Pl. 15, fig. 13. There are a fair number of small specimens in which the striae or fine costae are generally much broken up. Most of the tests have a short neck, only just showing; in the one figured it is more pronounced than is usually the case. The tests are regular in shape.—*Locality*: Chiefly No. **15.**

Lagena lineata Williamson sp. (Pl. 15, figs. 14, 15).

Entosolenia lineata Williamson sp., 1848, p. 18, pl. 2, fig. 18.

The typical form occurs rarely, but at a good many localities. Odd specimens appear to be non-apiculate, like fig. 14. This species seems to pass insensibly into *L. costata*.

Pl. 15, fig. 15 shows the lines assuming an S-shaped condition. —*Locality :* Occurs rarely at two or three stations.

It is impossible in certain cases to separate the striate from the very finely costate forms, but many are undoubtedly costate. They are rarely in the apiculate condition.

Lagena costata Williamson sp. (Pl. 15, figs. 16–20, 21).

Entosolenia costata Williamson, 1858, p. 9, pl. 1, fig. 18.

The specimens are numerous. Both the strength of the costae and their number vary greatly. Type specimens are present.—*Locality :* Various stations.

The following are interesting examples :

Pl. 15, fig. 16. This has a slightly projecting ring at the base.—*Locality :* About a dozen from various stations.

Pl. 15, fig. 17. An odd specimen.—*Locality :* No. **29.**

Pl. 15, fig. 18. In this the costae are only six in number. Only one occurs.—*Locality :* Uncertain.

Pl. 15, fig. 19. In this the costae are curved and well developed. Only one found. Orifice circular.—*Locality :* The exact locality is uncertain.

Pl. 15, fig. 20. In this some of the costae only reach part way down the test. The mouth is circular. There are two or three specimens on the slide.—*Locality :* Exact locality uncertain.

Pl. 15, fig. 21. As there is only a single specimen to judge by, and that one somewhat asymmetrical, it is placed here with a query against it. It is quite opaque. The orifice is a simple opening, with three radiating fissures. I thought it might possibly be a seed case, but on touching it with hydrochloric acid I found that it at once effervesced. It seems to be allied to *Trigonulina globosa* Seguenza, 1862, pl. 2, figs. 60–62.—*Locality :* No. **3.**

Lagena acuticosta Reuss (Pl. 15, figs. 22, 23).

Lagena acuticosta Reuss, 1861, p. 305, pl. 1, fig. 4.

This is an unsatisfactory species, for it is simply a form of *L. costata.* The few specimens that occur are similar to the *Challenger* figure, pl. 58, fig. 21.

Pl. 15, fig. 22 is practically the same as the *Challenger* figure, pl. 57, fig. 32.—*Locality :* No. **3.**

Pl. 15, fig. 23. This appears to be a weak and rotund form of the type, having only three costae.—*Locality :* No. **3**. Only one occurs.

Lagena melo d'Orbigny sp.

Oolina melo d'Orbigny, 1839, p. 20, pl. 5, fig. 9.

Only a few occur.—*Locality :* Exact locality uncertain.

Lagena hexagona Williamson.

Entosolenia squamosa var. *hexagona* Williamson, 1848, p. 20, pl. 2, fig. 23.

The examples are small. Some are globular, and a few take the form of *L. laevis*, having a well-produced and transparent neck.—*Locality :* Uncertain.

A compressed form is present. The specimens are very small, almost circular in outline and compressed. Orifice fissurine.—*Locality :* Uncertain.

Lagena seminuda Brady.

Lagena seminuda Brady, 1884, p. 472, pl. 58, fig. 34.

There is only a solitary specimen of this beautiful form. The test is fractured, showing the wall to be very thick.—*Locality :* No. **28**.

Lagena sulcata Walker and Jacob sp. (Pl. 15, figs. 24, 25).

Serpula (*Lagena*) *striata sulcata rotunda* Walker and Boys, 1784, p. 2, pl. 1, fig. 6.

Serpula (*Lagena*) *sulcata* Walker and Jacob, 1798, p. 634, pl. 14, fig. 5.

Fine specimens occur, but somewhat rarely. The tests vary greatly in their shape and size, likewise in the number of costae. They are mostly in the apiculate condition.

Pl. 15, fig. 24. This is a stout form, with a few of the costae produced at the base. The short neck is heavily rimmed.—*Locality :* Two at No. **3** and one at No. **8**.

Pl. 15, fig. 25 has tubular spines encircling the base. The test is apiculate. Two occur ; one is much damaged, but has the neck straight, and probably had more spines than the one figured. —*Locality :* Nos. **30, 32**.

Lagena gracilis Williamson.

Lagena gracilis Williamson, 1848, p. 13, pl. 1, fig. 5.

This variable species occurs sparingly at a good many stations. Forms similar to the *Challenger* illustrations, pl. 58, figs. 3, 7, 8, 9 and 23, are present, besides some that tend towards the apiculate form of *L. striata*.—*Locality :* Chiefly No. **17**.

Lagena semistriata Williamson.

Lagena striata var. *β semistriata* Williamson, 1848, p. 14, pl. 1, figs. 9, 10.

The tests, which are not very numerous, vary a good deal in their contour. A few are of the *L. clavata* form ; and one or two, with their projecting spines at the base, are very near to *Oolina striaticollis* d'Orbigny, 1839, pl. 5, fig. 14.—*Locality :* Chiefly Nos. **21**, **22**.

Lagena thornhilli sp. nov. (Pl. 15, fig. 26).

Body of test globular or slightly ovate, round in section, with long, tubular neck. Three wings, equidistant, run from the orifice to the edge of the test and thence, as a small keel, down to the centre of the base. In each of the three partitions are two raised oval rings, slightly pointed at their ends, one within the other. The wings are sometimes striated. The late Mr. Thornhill was particularly interested in this handsome Lagena, and often spoke of it as the "New Zealand Chief," for it reminded him of the way in which a chief is decorated. I have, therefore, named it after him. It seems to be a winged and varied form of *L. sulcata*. The striae referred to above show in another specimen, which is not in such good condition as the one drawn. Five are marked on the chart as occurring. One is very badly broken and is a doubtful specimen. Two others are broken and not quite typical.—*Locality :* Nos. **2**, **3**, **6**, **7**.

Lagena striato-areolata Rymer Jones (Pl. 15, fig. 27).

Lagena vulgaris Williamson var. *striato-areolata* Rymer Jones, 1872, p. 53, pl. 19, figs. 21, 21*a*.

Body of test ovate, neck long, four small wings start part way up the neck and run down to the sides of the test. About three-

quarters of the body is covered with irregular, more or less hexagonal, net-work; the upper portion between the four keels is decorated with a few fine costae. A couple of spines project from the base. A single specimen only. Unfortunately I have lost it, but my drawing of it was finished before this happened. The specimen has the areolations much more extended over the surface of the test than Jones's drawings indicate, otherwise it agrees well with his description.—*Locality :* No. **17**.

Lagena stelligera Brady. (Pl. 15, figs. 28, 29, and Pl. 16, figs. 1–4).

Lagena stelligera Brady, 1881, *Quart. Journ. Micr. Sci.*, vol. 21, N.S., p. 60.

Lagena stelligera Brady, 1884, p. 466, pl. 57, figs. 35, 36.

There is an extraordinary range of variation in this species, if I am right in my diagnosis. About forty examples are on the slide, besides twenty-five of the variety in which the costae at the base are absent. Pl. 15, fig. 28 is drawn from the largest one present, and the tests pass insensibly into such forms as Pl. 15, fig. 29 and Pl. 16, fig. 1. There are examples somewhat similar to Pl. 15, fig. 29, showing the costae bridging the space at the lower part of the body of the test. The variety without costae, Pl. 16, fig. 2, (the absence of which is referred to by Brady in the *Challenger* Report) is represented by both stouter and larger specimens than the one figured, and also by more slender ones. Examples are present that, if found by themselves, might pass for apiculate (tubular) forms of *L. semistriata* or *L. sulcata*, and again others might be placed with *L. gracilis*. These I take to be intermediate forms.

Pl. 16, fig. 1 approaches *L. gracilis*, but there are forms present in which the costae run the whole length of the test, and the tubular, apiculate portion is more slender. In all cases the apiculate process is tubular, and at times funnel-shaped. The entosolenian tube is sometimes straight, sometimes attached to the side of the test. In the larger specimens the tests are opaque. Parker and Jones, 1865, pl. 16, fig. 9, figure a test which in outline is similar to the "nude" form referred to above, but I think they refer it to a "nude" form of *L. caudata* d'Orbigny.

Egger's *L. crenulata*, 1893, pl. 10, fig. 86, may belong to the *L. stelligera* series.—*Locality :* Chiefly Nos. **7, 17, 31, 32.** *Locality :* "Nude" form, chiefly No. **17**.

Pl. 16, fig. 3. In this variation the test is ovate or pyriform. Orifice oval. The internal tube is always coiled back upon itself. The test is smooth and transparent, but apparently when aged it becomes opaque and roughened. Brady states in the *Challenger* Report, p. 466, that "the circular rim varies considerably in depth," and in this case the rim is shallow.—*Locality :* Chiefly Nos. **17, 30, 32**.

Pl. 16, fig. 4 is evidently the compressed variety, and very rare.—*Locality :* Two at No. **29** and odd specimens at four other localities.

Lagena stelligera Brady var. nov. *eccentrica* (Pl. 16, figs. 5, 6).

Test flask-shaped, with or without a true neck. Surface smooth. An irregular ridge encircles the lower part of the base, as shown in the illustration. This ridge occurs also in an oval form. I think most probably these are connected with the "nude" variety of *L. stelligera*. Only four found, of which one is a little compressed.—*Locality :* Nos. **7, 21, 31.**

Lagena exsculpta Brady.

Lagenulina sulcata Terquem, 1876, p. 68, pl. 7, fig. 9.

Lagena exsculpta Brady, 1884, p. 467, pl. 58, fig. 1, pl. 61, fig. 5.

Four only found, and they are all in the compressed condition, as figured by Brady, 1884, pl. 61, fig. 5.—*Locality :* No. **1**.

Lagena striatopunctata Parker and Jones (Pl. 16, figs. 7–10).

Lagena sulcata var. *striatopunctata* Parker and Jones, 1865, p. 350, pl. 13, figs. 25–27.

Pl. 16, fig. 7 has the sides convex. Only one occurs, but a somewhat similar though slenderer form is found at several stations.—*Locality :* Chiefly Nos. **1, 19, 22**.

Pl. 16, fig. 8. This is a stout form, and is evidently the one referred to by Mr. Millett, 1901, p. 489, Malay Report, as having the costae flattened or even hollowed out. Rare. A very similar variety, having the costae thin, is frequent. The two

forms are on the same square and so the separate localities cannot be given.—*Locality :* Thirty-seven at No. **19**. Frequent at Nos. **21**, **22**, and a few other stations.

Pl. 16, fig. 9. Very rare.—*Locality :* No. **20** and several others.

Pl. 16, fig. 10 is an exceedingly finely marked variety. The lines of pores lie very close together, and I cannot make out whether they are on a ledge or not. It may be *L. feildeniana*, but I have decided to place it here, on account of the bent neck so often characteristic of *L. striatopunctata*. It is very rare.—*Locality :* Two at No. **19**, and odd specimens at one or two other stations.

Lagena striatopunctata Parker and Jones (?) var. nov. *complexa* (Pl. 16, fig. 11).

This elegant variety has the surface of the costae hollowed out and the spaces between them roughened by granular shell-growth ; showing through this are two or three lines of detached, minute tubercles, running lengthwise down the test. The shell-growth does not appear in the drawing, as I wished the tubercles to appear plainly. There is a tendency in this variety to disintegrate, and when this has happened a complete shell-wall is revealed, with many spines attached to it. There is one perfect specimen, and another nearly so. One, which I believe to be the same variety, has only the inner shell left, with many spines and bits of costae. It is just possible that this is a compound-walled Lagena, and therefore I have put a query against it. There are several other Lagenae on the square that do not belong to the same species, and so the exact locality cannot be given.

Lagena striatopunctata Parker and Jones var. nov. *inaequalis* (Pl. 16, fig. 12).

This is a handsome variety. The test near the base is round, or nearly so, in section, but gradually becomes compressed as it approaches the orifice, which is fissurine. From each side of the orifice springs a keel, thickened at the edge, which dies away a short distance down the test. Between the punctate costae there is a very fine short and slightly raised plain costa, which varies in

length, but this is not always present. One specimen has three equidistant keels springing from the orifice and running well down the test, and as the whole shell remains round in section, it may be taken as the trifacial form. This was found at No. **7**.—*Locality :* It is marked as occurring at the following : Nos. **3, 6, 9, 10, 15, 17**. Very rare. As there are two tests on the square which do not belong to the set, the respective localities become uncertain.

Lagena striatopunctata Parker and Jones var. nov. *fusiformis* (Pl. 16, fig. 13).

There is only one specimen of this beautiful Lagena. It has nine thin costae running lengthwise down the test. The perforations of the costae are very fine, and cause a slight bulging at the sides. My drawing is not delicate enough in this respect. The body of the test is a little roughened and semi-opaque, and this is owing to innumerable fine pores.—*Locality :* No. **1**.

Lagena striatopunctata Parker and Jones var. *spiralis* Brady (Pl. 16, fig. 14).

Lagena spiralis Brady, 1884, p. 468, pl. 114, fig. 9.

Nearly one hundred specimens are on the slide. I remember Mr. Thornhill remarking that he was tired of picking them out. They vary greatly in their contour, and also in the amount of "screw" that the costae take on. In all cases these run a little up the neck, the perforations ceasing before the costae. In one or two instances the perforations are confined to the base of the test, and one or two have the neck bent to one side, as is so often the case in the type form. It is marked to occur at thirteen stations.—*Locality :* Chiefly Nos. **1, 2, 19, 21, 22**.

Lagena desmophora Rymer Jones.

Lagena vulgaris var. *desmophora* Rymer Jones, 1872, p. 54, pl. 19, figs. 23, 24.

The examples are similar to the *Challenger* illustration, pl. 58, fig. 43. Nine found. In all except one the decoration is confined to the lower half of the test.—*Locality :* Nos. **25, 31, 32**.

Lagena foveolata Reuss (Pl. 16, fig. 15).

Lagena foveolata Reuss, 1862 (1863), p. 332, pl. 5, fig. 65.
Lagena No. 25 von Schlicht, 1870, p. 10, pl. 3, fig. 25.

Pl. 16, fig. 15. This is exceedingly delicate in its sculpture, and it is very likely the same as the one figured by Mr. Millett in his Malay Report, 1901, pl. 1, fig. 15. His drawing is much more satisfactory than mine. The test glistens. Three are marked on the Chart, but one of the three on the slide is *L. striata*, so the exact locality of the other two becomes uncertain. —*Locality :* Nos. **1, 20, 26.**

Lagena foveolata Reuss var. (Pl. 16, figs. 16, 17).

This is an interesting variation. About thirty-five are on the slide; all are apiculate and nearly all are in perfect condition. The cells are quite distinct and their bases show no sign of perforation.—*Locality :* Chiefly Nos. **17, 29,** also very rarely at various stations.

Lagena foveolata Reuss var. nov. *spinipes* (Pl. 16, figs. 18–21).

In this variation some of the costae project at regular intervals round the base and also carry very narrow, minute, blunt spines as shown in the drawings. These spines appear to be tubular. In some of the specimens they are absent, but probably they have been broken off, as on a careful examination minute, loop-like orifices can be detected. Many of the tests have so much exogenous shell-growth filling up the cells that it is with difficulty the cross-bars can be detected, but on breaking open such a test, mounting it in Canada balsam, and viewing the inside concave surface by transmitted light, the cross-bars show quite distinctly.

Pl. 16, figs. 18, 20 must be taken as being more or less diagrammatic representations.—*Locality :* Chiefly Nos. **9, 17, 19** and odd examples from a few other stations.

Pl. 16, fig. 21. A solitary specimen, evidently a rotund form.

Lagena foveolata Reuss (?) var. nov. *paradoxa* (Pl. 16, figs. 22, 23).

The test is flask-shaped, always elongate, with a short neck, slightly thickened at the orifice. Fine costae run down the test.

The cells are formed by cross-bars between the costae, which are not so high as the costae, and are all filled with exogenous shell-growth. Nearly all the tests show signs of disintegration, and when this has taken place the shell-wall shows transparent, with rows of minute spines arranged in lines, as shown in fig. 23. I am unable to state whether these spines are tubular. In more than one case the whole of the outward part of the test has gone, leaving the inner shell bare, except for the spines.

The superstructure is thick, as can be seen in fig. 23. There are over fifty on the slide. The cross-bars can be detected in a few of the large tests only; but when a broken test is mounted in Canada balsam, and viewed on the inside, concave surface, by transmitted light, the cross-bars are quite distinct and are arranged in line and not alternately. The tests are opaque and of a pale cream colour. The opaqueness is probably due to age. The question naturally arises—is this a true *L. foveolata* and is all this shell-growth the result of age? Perhaps *L. seriato-granulosa* Reuss, 1870, p. 468, No. 16—Schlicht, 1870, pl. 38, fig. 20, is related to, or identical with, this form. Schlicht's illustration seems to show a change of the surface ornament close to the neck. Is this the beginning of the disintegration which is so common in my specimens? Schlicht's figure and its description are not sufficient for absolute identification. Brady puts this figure under *L. striatopunctata* in the *Challenger* Report.

Lagena lamellata sp. nov. (Pl. 16, figs. 24, 25).

This belongs to the class of Lagenae that have their walls compound. There are two large specimens on the slide, one of which is almost in perfect condition. The long neck has the spiral sculpture, and is normally straight. The colour is a pale cream. The surface of the test seems to be built up of thin flakes, arranged in an irregular manner, which, although rough, glisten to a certain extent. Damaged specimens show the compound shell-wall to be of extraordinary thickness. The outer, flaky surface appears to be held up by fine spines (tubular, I think), and the interstices partially filled with exogenous shell-growth.

The section, fig. 25, of part of a broken example from a *Penguin* station shows the relative widths of shell-wall and

test. The shaded portion represents the exogenous shell-growth. Three tests are on the slide, but one of them does not belong to this species.—*Locality :* Nos. **20, 21.**

Note.—It is impossible to deal satisfactorily with the different forms of the compound-walled Lagenae unless good sections can be obtained. I am at present unable to undertake the work, partly from not wishing to sacrifice specimens, especially when very rare, and also from inability to use the very high-power lenses which are necessary for the small specimens. It is not difficult to grind down half the test, if you have specimens to spare for failures. Many of the tests, however, are exceedingly friable, and once in the Canada balsam and heated, I doubt if they would bear turning over, in order to procure thin sections. It will be understood that with the test only partly ground down, the illumination must be from above ; a difficulty which I cannot overcome when using high-power lenses, no doubt owing to my technical ignorance. The following descriptions are given to the best of my ability.

Lagena hertwigiana Brady var. nov. *undulata* (Pl. 16, figs. 26–28).

There are about one hundred examples on the slide, and I believe them to be a variety of *L. hertwigiana.* The test is round in section, more or less ovate or pyriform in outline, with a long, delicate neck which broadens out a little at the orifice. The body of the test is covered with slight ridges, which give it a wavy appearance. There is a single row of perforations between the ridges. The wall is compound and appears to be cellular. Brady, in the *Challenger* Report, refers to a variety which has the perforations arranged in lines, as in *Nodosaria intercellularis*, but does not mention the ridges. The long neck is rather more delicate than represented in my drawings. The tests are opaque and of a light cream colour.—*Locality :* Chiefly Nos. **1 3, 7, 13, 17, 28.**

Pl. 16, fig. 28. This varies from above in having the perforations much closer together and the ridges even less raised. It is semi-transparent and very rare. On breaking one of the specimens a short, straight, entosolenian tube was revealed. The wall of the test appeared to be cellular.

Lagena pacifica sp. nov. (Pl. 16, fig. 29).

The test is ovate, elongate, and has a long, delicate neck. The surface, under a high power, appears to be marked all over with irregular depressions, and shines to a certain extent. The wall is compound, but I am at present unable to ascertain its exact nature. Very rare.—*Locality :* Nos. **1**, **22**, and a few other stations.

Lagena pannosa Millett.

Lagena pannosa Millett, 1901, p. 11, pl. 1, figs. 12–14.

There is only one example, and it is of the variety *L. pannosa* var., fig. 14. Mr. Millett states that in this variety "the disintegration is more irregular and the zones are not produced." The test is more globular than the one figured by Mr. Millett.—*Locality :* Exact locality uncertain.

Lagena spumosa Millett var. (Pl. 16, fig. 30).

Lagena spumosa Millett, 1901, p. 9, pl. 1, fig. 9.

Mr. Millett considers this to be a variety of his *L. spumosa*. It differs from the type in not having the "bird's-clawlike" process at the oral end, but simply a short, straight, transparent blunted point to the test, which is flattened at the base. The shell-wall is compound. The test is much more brittle than one would expect from its appearance.—*Locality :* It occurs rarely at twelve stations, but chiefly at No. **30**.

Lagena chasteri Millett (Pl. 16, fig. 31).

Lagena chasteri Millett, 1901, p. 11, pl. 1, fig. 11.

This occurs sparsely at a few stations. Some of the smaller examples are more slender than the one figured, and in these the neck and upper portion of the test are inclined to be bent a little to one side. The curious little "stopper" at the orifice is sometimes difficult to make out; Mr. Millett tells me it is characteristic of the species.—*Locality :* Exact localities uncertain.

Lagena chasteri Millett, var. (?) (Pl. 16, figs. 32–34).

These appear to me to be variations of the type. Some, at any rate, show the "stopper" at the orifice. The test is very finely pitted all over, and in certain conditions minute pores can be seen quite plainly, under a magnification of one hundred diameters.

Pl. 16, fig. 33. In this the surface is not so polished as in Pl. 16, fig. 32.

Pl. 16, fig. 34. The test is a good deal roughened, and the pores show much more plainly.

The specimens are placed under the above heading provisionally, until the exact nature of the shell-wall can be ascertained by sections. Rather rare.—*Locality :* Exact stations uncertain. Taking these and the type form together, they occur at various stations, including Nos. **20, 21.**

Lagena intermedia sp. nov. (Pl. 17, figs. 1–3).

There are thirty-one specimens brought together on the slide, eleven of which belong to these gatherings, and as they agree so well in their chief characteristics I have given them a specific name. Many of them agree with Brady's *Challenger* drawing, fig. 20, pl. 57, which he calls an intermediate form, resembling *L. crenata* and *L. semistriata*.

The specimens vary in contour, and are nearly all transparent. There is a ridge running round the base, and immediately above this is a series of grooves (more or less pointed at the top) encircling the lower part of the test. The entosolenian tube is straight. The base of the test is covered with an irregular, mesh-like set of partitions, much blocked up by shell-growth. The solid portion at the apex of the test, through which runs the pseudopodial passage, is characteristic of the species. Rare.—*Locality :* Nos. **28, 30, 32.** Solitary specimens at a few other stations.

Lagena sp. incert. (Pl. 17, figs. 4, 5).

There are nine specimens on the slide, one or two of which are in a very poor condition, and only three belong to these *Water-witch* gatherings. I have figured the one that is in the best state. One or two of the set are a little compressed. The orifice is stellate, and the entosolenian tube is bent to one side. The body of the test is striate, except the upper part ; a decorated collar runs round the base, and from this springs downwards what may have been the decorated wall of another chamber, but this is only surmise. The edge of this wall shows signs of fracture in all these specimens. There appears to have been an inner chamber, when the specimen was in perfect condition, but as this

is fractured in all the examples found, one cannot be certain of its exact nature. The convex base apparently belongs to this inner chamber (?). The drawings will explain better than any written description. It may turn out to be a complex species of a new genus.—*Locality:* Nos. **3, 17**, and one specimen (doubtful) at No. **29**.

Lagena sp. incert. (Pl. 17, fig. 6).

There are only two examples of this doubtful Lagena. The oval body of the test is slightly roughened, semi-transparent, and apiculate. I am not sure if the apiculate process is tubular. In both cases the long, tubular neck is fractured at the end, so we are left in ignorance as to the nature of the aperture. The *Oolina lanceolata*, Terquem, 1858, pl. 1, fig. 1, is the nearest in outline to my drawing that I have noticed.—*Locality:* No. **11**.

Lagena laevigata Reuss sp.

Fissurina laevigata Reuss, 1850, p. 366, pl. 46, fig. 1.

This common species is found at nearly all the stations, and the specimens vary greatly. Some are very large and others minute. A few are circular in outline and much compressed. The *Fissurina oblonga* Reuss, 1862 (1863), p. 339, pl. 7, fig. 89, is present, and also a form similar in outline, which has the mouth placed at one side and the entosolenian tube attached to the back of the test. Specimens occur which are much flattened and have very short necks.

Lagena laevigata Reuss sp. var. (Pl. 17, fig. 7).

This form of *L. laevigata*, with its curious orifice, appears to be allied to *L. millettii*, Chaster, 1892, p. 61, pl. 1, fig. 10. Most of them have a very small pimple at the base. It occurs at several stations.—*Locality:* Chiefly No. **19**.

Lagena laevigata Reuss sp. var. nov. *virgulata* (Pl. 17, fig. 8).

There are four small, narrow, opaque markings on the test, two on either face. They are placed rather below the middle, and I think they are sometimes just raised above the surface. The contour of the test varies both as to compression and length.

Entosolenian tube straight. Orifice oval. A few have the base rounded off, but others are more or less pointed.—*Locality :* No. **17** and various other stations.

Lagena acuta Reuss sp. (Pl. 17, fig. 9).

Fissurina acuta Reuss, 1862, p. 340, pl. 7, fig. 90.
F. apiculata, p. 339, pl. 6, fig. 85.

Again one has to deal with a great variation in form. Elongate examples like fig. 9 are very rare, and they are very slightly compressed. These correspond to the *F. apiculata* of Reuss. Small examples which are ovate, or pyriform, in outline, are common. These latter generally have the apiculate process very small.—*Locality :* Various.

Lagena acuta Reuss sp. var. nov. *virgulata* (Pl. 17, fig. 10).

The form is that of *Fissurina apiculata* Reuss, 1862, p. 6, fig. 85, and has the four curious markings, two on either face, referred to before under *L. laevigata* var. The body of the test becomes more compressed as it approaches the orifice, which is fissurine and almost closed.—*Locality :* It occurs at a good many stations. Five are marked on the Chart as being found at No. **29**.

Lagena acuta Reuss sp. var. (Pl. 17, fig. 11).

I think this may be treated as a variety of *L. acuta*. The test is only slightly compressed, and when viewed endways, looking down on the orifice, it has rather a square appearance, caused no doubt by the three lines of perforations being situated at the four corners, so to speak. A few have the base rounded, but the others are more or less pointed. The tube is short and straight. I cannot make out the exact nature of the orifice. It is very minute and seems to be circular. As a rule, the perforations are confined to three lines. Nineteen found.—*Locality :* Nos. **1**, **7**, **14**, and a few others.

Lagena lucida Williamson sp. (Pl. 17, figs. 12–14).

Entosolenia marginata var. *lucida* Williamson, 1848, p. 17, pl. 2, fig. 17.

This pretty little foraminifer is found at a few stations, but is always very rare, though typical. Pl. 17, fig. 12, represents

a circular form and is inclined to be bluntly carinate. Three only occur.—*Locality :* Uncertain.

Pl. 17, fig. 13 is circular in section and is probably a variation of the trifacial form, which generally has the sides more or less flattened. Four occur, one of which is much more globular than the one selected for illustration.—*Locality:* Nos. **1**, **3**, **18**, **29**.

Pl. 17, fig. 14. This appears to be *L. lucida* in a spinous condition, rather than *L. staphyllearia* in a *lucida* condition. Only one found.—*Locality :* No. **29**.

There is also another very similar to the above, in which the lower half of the keel splits and becomes triple. The central one is serrated.—*Locality :* No. **23**.

Lagena multicosta Karrer sp.

Fissurina multicosta Karrer, 1877, p. 379, pl. 16*b*, fig. 20.

Fissurina bouei, Ibid. p. 378, pl. 16*b*, fig. 19.

There are a few very small examples of this species and they are mixed up with *L. costata* on the slide, so that the exact localities cannot be given.

Lagena fasciata Egger sp. (Pl. 17, fig. 15).

Oolina fasciata Egger, 1857, p. 270, pl. 5, figs. 12–15.

The type form is very rare.

Pl. 17, fig. 15. This is the *L. annectens* Burrows and Holland, 1895, p. 203, pl. 7, fig. 11. It is very small, beautifully transparent, and the tube is short and straight. The examples vary in form from globular to moderately compressed. Very numerous.—*Locality :* They were nearly all found at Nos. **8**, **9**, **11**.

Lagena fasciata Egger sp. var. nov. *spinosa* (Pl. 17, figs. 16, 17).

There are a good number of this interesting form. In the larger examples the curved bands are generally distinctly raised. Sometimes, especially in the smaller ones, the curved bands are little more than fine, opaque lines. The basal spines are well developed. The aperture is long, curved and almost closed, and I think is composed of a series of fine pores. The entosolenian tube varies in length, but is always straight. The edge of the test is sometimes flattened. These specimens might, with equal

propriety, be regarded as a decorated form of *L. staphyllearia*.—*Locality:* It occurs at seventeen localities, chiefly Nos. **1**, **3**, **9**, **17**, **18**, **29**, **32**. Pl. 17, fig. 16 is drawn from the largest specimen.

Lagena fasciata Egger sp. var. *carinata* Sidebottom (Pl. 17, fig. 18).

Lagena fasciata Egger sp. var. *carinata* Sidebottom, 1906, *Mem. Pro. Lit. Phil. Soc. Manchester*, p. 7, pl. 1, fig. 17.

The test is compressed, carinate and apiculate. The curved bands on both faces are extremely fine and perhaps just raised above the surface. There seems to be no reason why it should not be brought under the above heading, although in the Delos examples the curved bands are broad and scooped out, the test little compressed, the keel not so prominent, and the apiculate process not present. It occurs at many stations.—*Locality:* Chiefly Nos. **18**, **19**.

Lagena staphyllearia Schwager sp. (Pl. 17, figs. 19–24).

Fissurina staphyllearia Schwager, 1866, p. 209, pl. 5, fig. 24.

Both the carinate and non-carinate forms are present, but the carinate is far more frequent. Sometimes there are only a couple of spines connected by a small keel, at others simply a keel, which is dentate.

Pl. 17, fig. 19. This form varies little, and occurs only at a few stations.—*Locality:* Chiefly at Nos. **9**, **11**, where it is common.

Pl. 17, fig. 20 has the orifice to one side and is hooded. The tube is attached to the back of the test.—*Locality:* Various stations, chiefly at No. **32**. Always rare.

Pl. 17, fig. 21. In this variety the keel is carried right up to the orifice, which is a narrow oval. In some of the specimens the two side spines are not placed quite so high up as in the one selected for illustration. The orifice is fissurine. This form appears to be closely allied to *Fissurina tricuspidata* Reuss, 1870, p. 470; von Schlicht, 1870, pl. 5, figs. 16–18.—*Locality:* Nos. **3**, **6**, **7**, **24**. Always very rare.

Pl. 17, figs. 22, 23. These are very small, and may perhaps be a weak form of the compressed variety named by Brady *L. longispina* in the *Challenger* Report. I cannot, however, see

my way to separate them from *L. staphyllearia*. The tube is straight.—*Locality :* Nos. **1, 3, 6, 7, 9, 14, 15, 17, 26.** Always extremely rare.

Pl. 17, fig. 24. Mr. Millett, in his remarks on *L. marginata* var. *seminiformis*, 1901, p. 620, refers to the tendency of *L. marginata* and its allies to duplicate the marginal keel. This is a case in point, the keel splitting on either side of the test as it approaches the base. The two longest spines are situated just at the splitting point, and generally there are two rows of smaller spines on the base of the test, between the keels. The tube is attached to one face of the test, and the orifice is fissurine. Rather rare.—*Locality :* No. **19.**

With the above are three tests that have a comparatively thick keel, which is thicker at its outer edge than at its junction with the body. This causes the latter to appear as if it were encircled by a fine, dark ring—a pretty effect. The keel splits at the base just sufficiently to admit of the spines being placed between. The tests are circular in outline and their sides convex.—*Locality :* One at No. **19**, the other two uncertain.

Lagena staphyllearia Schwager var. nov. *quadricarinata* (Pl. 21, fig. 16).

Test very slightly compressed, almost circular in outline. Internal tube attached. Orifice a narrow slit. The carina at the sides is very much more developed than the one that cuts it at right angles through the centre of the base.—*Locality :* Eight occur at No. **1**, two at No. **3**, and odd specimens at Nos. **14, 29, 32.**

Lagena unguiculata Brady (Pl. 17, fig. 25).

Lagena unguiculata Brady, 1881, *Quart. Journ. Micr. Sci.*, vol. 21, N.S., p. 61.

Lagena unguiculata Brady, 1884, p. 474, pl. 59, fig. 12.

Brady admits that this differs little from *L. staphyllearia*, and the curved teeth he refers to are not confined to this variety. All the tests in these gatherings have the lower part of the body roughened and opaque, as shown in the drawing. The oral end is sharp and the tube short and straight.—*Locality :* At No. **1**, eight occur ; at No. **23**, one ; at No. **24**, two ; and one at Nos. **25, 26, 27** : fourteen in all.

Lagena quadrata Williamson sp. (Pl. 17, figs. 26–28).

Entosolenia marginata var. *quadrata* Williamson, 1858, p. 11, pl. 1, fig. 27.

This is only occasionally met with in the collection, but several variations are of interest. Both the form with the rounded edge and that which is slightly carinate occur.—*Localities :* Various.

The partially carinate form, similar to the *Challenger* figure, pl. 59, fig. 16, is frequent at locality No. **19**, and very rare at three other stations.

Pl. 17, fig. 26. There are only three of this curiously hooded variety. The test is slightly curved and the tube is attached to the back. Except for the bending of the test it is almost identical with Balkwill and Millett's drawing, 1884, pl. 1, fig. 11. —*Locality :* Exact stations uncertain.

Pl. 17, fig. 27. The two spines, one at either side of the orifice, appear to be round, and not flattened, as one would expect. Five examples are in the "quadrate" condition, and three others have the sides of the test slightly convex and are not so elongate.—*Locality :* Five found at No. **11**, two at No. **13**, one at No. **18**.

Pl. 17, fig. 28. A single specimen only occurs, having a well-marked keel at each end of the test. The orifice is placed at the junction of the keel with the body.—*Locality :* No. **3**.

Lagena marginata Walker and Boys (Pl. 17, figs. 29–31, and Pl. 18, figs. 1–3).

"*Serpula* (*Lagena*) *marginata*" Walker and Boys, 1784, p. 2, pl. 1, fig. 7.

This species is splendidly represented in these gatherings. There is great variation both in size and shape, and also in the development of the carina, which in many examples completely encircles the body of the test and in others is confined to the base. Intermediate forms occur. In a few cases the body of the test, as well as the carina, is apiculate.

The entosolenian tube is generally attached to one face of the test, but in some instances it is short and straight. The orifice likewise varies in character and position. The body is frequently decorated, in various ways, as in *L. orbignyana*. One or two examples are very near to *Fissurina bicaudata* Seguenza, 1862, pl. 2, fig. 16. The following are interesting variations :

Pl. 17, fig. 29. There are only two of these. Four others have the body of the test more elongate. I have unfortunately broken the one from which the illustration was drawn.—*Locality :* Exact stations uncertain.

Pl. 17, fig. 30. In this elegant form the keel is continuous round the body. In nearly all cases the carina is bent backwards—that is, if one considers the orifice as opening out on the face of the test. The entosolenian tube is attached to the back of the test, which is much more convex than the face. It may be related to *L. marginata* Walker and Jacob var. *inaequilateralis* Wright, 1884–5, app. 1886, pl. 26, fig. 10, but the keel is much more developed, and the orifice is a simple opening and of an entirely different character.—*Locality :* Chiefly at Nos. **11, 14**.

Note.—A curious feature of the entosolenian tube in this variety, which I have not noticed before, is that it is only half a tube, if one may use the expression, with its edges attached to the wall of the test, part of the wall thus helping to form the tube. This peculiarity is best seen when viewed from the back. My attention was drawn to this feature by one of the specimens having the internal opening of its tube of specially large size and arched instead of circular. On further examination it was accounted for in the way I have explained above. I do not know if this peculiarity has been noticed before, but after examining further I find it is not limited to this particular variety.

Pl. 17, fig. 31. An elongate form. Tube attached. Orifice compressed, the front edge lower than the back.—*Locality :* Nos. **18, 19**, and a few others. Always rare.

Pl. 18, fig. 1. This foraminifer appears to be closely allied to the *L. seguenziana* Fornasini, 1886, pl. 8, figs. 1–8. Unless it is viewed edgeways the exact contour of the test may easily be overlooked. Only one occurs.—*Locality :* Probably No. **1**.

Pl. 18, fig. 2. This is an exceedingly large specimen. The keel has the appearance of being composed of two layers, but I believe this is not so. The central body is highly convex and is badly fractured on one side. One only found.—*Locality :* No. **28**.

Pl. 18, fig. 3. The test is a good deal compressed and has a broad, semi-opaque band running round it on either side, adjoining the carina. The carina is a true one and of clearer shell-substance than the body of the test. On the Chart, three

specimens are marked (not necessarily alike), but there is only one on the slide.—*Locality :* Exact station uncertain; either No. **2** or No. **11**.

Lagena marginata Walker and Boys, var. (Pl. 18, figs. 4, 5).

There are a good number of these forms and no line of demarcation can be drawn between them. Nearly all of them have four costae running up the neck, two on either side. Those in which these costae are absent are similar to the *Challenger* drawing, pl. 59, fig. 6, which, Brady states, "might, with equal propriety, be treated as a mucronate example of *L. marginata*," and such I take them to be. Several of the specimens might be looked upon as the apiculate form of *L. marginata* var. *semimarginata* Reuss.—*Locality :* Chiefly No. **29**.

Lagena marginata Walker and Boys var. *catenulosa* Chapman (Pl. 18, fig. 6).

Lagena marginata var. *catenulosa* Chapman, 1895, p. 28, pl. 1, fig. 5.

After drawing this solitary specimen, I was unfortunate enough to break it. There was a good deal of exogenous shell-growth, which interfered with the definition of the chain-like borders which encircle the body of the test, referred to by Chapman. Fortunately, in another set of soundings from the S.W. Pacific, there are four fine examples which I shall hope to figure in the future. The outer circle of chain-work (well raised up), if not the inner one, is on the carina.—*Locality :* Exact station uncertain.

Lagena marginata Walker and Boys var. nov. *umbonata* (Pl. 18, fig. 7).

Test compressed and surrounded with a well-developed carina. A few costae, starting close to the orifice, radiate downwards to the upper part of the body of the test, on both faces. A well-raised "boss," generally ribbed, is placed near to the base on both sides, and free of the keel. Internal tube short and straight. The oral end is oval and the actual orifice a very narrow slit. Twelve examples occur.—*Locality :* Nos. **3, 13, 17**.

Lagena marginata Walker and Boys var. nov. *raricostata* (Pl. 18, figs. 8, 9).

Pl. 18, fig. 8. This looks very like the form figured by Rymer Jones, 1872, p. 52, pl. 19, fig. 19, under the name *Lagena vulgaris* Williamson var. *striata* Montagu, the only apparent difference being that my examples are compressed, and his specimen, I presume, was round in section. The test is slightly compressed near the base, and gradually becomes more so until the orifice, which is fissurine, is reached, at which point the compression is well marked. The one figured has only two costae on each face of the test; in the others a central costa is added, but is not so well marked. The carina is well developed. Six occur, one of which is very short, and is an intermediate form between this and fig. 9.—*Locality:* It occurs very rarely at Nos. **1**, **2**, **17**, **23**.

Pl. 18, fig. 9. Test compressed, carinate. The two chief costae start from the orifice, on both sides of the test, and bend round the convex surfaces of the body of the test, spreading out a little as they approach its base. There are two curved, subsidiary costae on either side of the main ones, and also a straight, short one between them. The keel is slightly pointed at the base, and the internal tube is short and straight. I think this may be taken as a variant of the form last described. Twenty are on the slide.—*Locality:* Chiefly Nos. **18**, **19**.

Lagena marginata Walker and Boys var. nov. *striolata* (Pl. 18, figs. 10, 11).

Test compressed, carinate, many riblets running lengthwise on both faces of the test. The orifice is phialine, and varies in the amount of its compression. Nearly all the examples have the spaces between the costae, or riblets, more or less filled with shell-growth, which is of a light yellow colour. The specimens vary in size and the riblets in number, these latter being sometimes extremely numerous. There are over fifty on the slide.—*Locality:* Chiefly Nos. **17**, **19**, **28**.

Pl. 18, fig. 11. There are four specimens, although not typical, which I think may be placed with the above. The shell is not so much compressed and the costae become weak as they approach the upper part of the test. The keel is better developed. The one figured is rather broader at the shoulders than the others,

but I chose it for illustration as it was in the best condition. The tube is short and straight. These forms may be allied to *Lagena marginato-radiata* Seguenza, 1880, p. 332, pl. 17, fig. 35.

Lagena marginata Walker and Boys var. nov. *elegans*
(Pl. 18, fig. 12).

Test compressed, carinate. The body of the test is covered with fine, broken-up striae, and is apiculate. The carina joins on to the apiculate process. This is a very neat form, and two examples only were found.—*Locality:* No. **26**.

Lagena marginata Walker and Boys var. nov. *retrocostata*
(Pl. 18, fig. 13).

Test compressed, carinate, with irregular costae running across each face, one (or two) of which curves back before it reaches the opposite side. There is a well-developed ring at the base. The orifice is small and circular, or nearly so. Four only occur. The costae are not always arranged as in the drawing, but they have the same characteristics, and there is no mistaking the species when once seen.—*Locality:* One was found at No. **8**. The other stations are uncertain.

Lagena marginata Walker and Boys var. nov. *armata*
(Pl. 18, fig. 14).

Test compressed, carinate. The orifice, which is circular and outspread, is slightly bent forwards. On both faces of the shell are two dimples, placed low down and close to the keel. In the centre of each of these dimples is a small "boss." There was only a single example of this interesting variety found, and I have either lost it or misplaced it on the slide.—*Locality:* No. **9**.

Lagena marginata Walker and Boys var. nov. *homunculus*
(Pl. 18, fig. 15).

Test compressed, carinate. Aperture fissurine, with a pointed spine curving downwards on either side. Low down on each side of the test a short spine projects, and between these at the base are two flattened processes, shaped like feet with the toes turned inwards. In several instances another spine, but pointed, is placed between the feet. This seems to be a variety of *L. marginata*, in which the keel is broken up in an extraordinary manner.

I think Nature must have been in a comical mood when she thought of this design. It at once suggests a caricature of the human figure. There are fourteen on the slide, and they vary little from the one figured.—*Locality :* Twelve were found at No. **11**, and one each at Nos. **8** and **13**.

Lagena marginata Walker and Boys var. *semimarginata* Reuss.

Lagena No. 64 von Schlicht, 1870, p. 11, pl. 4, figs. 4–6 ; and *No. 65*, p. 11, pl. 4, figs. 10–12.

Lagena marginata var. *semimarginata* Reuss, 1870, p. 468.

The form as figured by Mr. Millett, 1901, p. 14, fig. 1, in his Malay Report is present, but is rare. That with the keel or wing, confined to the upper portion of the test, is extremely rare.—*Locality :* Exact stations uncertain.

Note.—See also remarks regarding Pl. 18, fig. 5.

Lagena marginata Walker and Boys var. *seminiformis* Schwager (Pl. 18, figs. 16–21).

Miliola stiligera Ehrenberg (?), 1854, pl. 31, fig. 6.

Lagena seminiformis Schwager, 1866, p. 208, pl. 5, fig. 21.

The fine examples of this variety of *L. marginata*, as figured in the *Challenger* Report, do not occur in these soundings, but the examples are interesting.

Pl. 18, fig. 16. This is an elongate variety. All have a short spine at the centre of the base. The internal tube, when present, is short and attached to the face of the test.—*Locality :* Twenty-seven occur at No. **11**. It is very rare at two or three other stations. One was found in the trigonal state.

Pl. 18, fig. 17. This only differs from the preceding in having a curious flange-like process at the base, on both faces of the test.—*Locality :* Nos. **21**, **23**. Very rare.

Pl. 18, fig. 18. This comes nearest to Schwager's figure. The tube is attached.—*Locality :* Nos. **1**, **2**, **18**, and several other stations. Rare.

Pl. 18, fig. 19. It is evident that this bears a strong resemblance to the "Crag" illustration, Jones, 1895, p. 200, pl. 7, fig. 10, assigned to *L. seminiformis* Schwager. The orifice is funnel-shaped and slightly bent forwards. Tube attached.—*Locality :* No. **13**. Only two found.

Pl. 18, fig. 20. The keel in this variation almost, but not

quite, loses itself at the sides of the test. The tube is attached and the aperture compressed.—*Locality :* No. **11.** Rare.

Pl. 18, fig. 21. The peculiarity in this case is that the two projections at the base close in upon a small, central spine, the effect under the microscope being that of two loops formed by a bright line.—*Locality :* No. **11.** Only two or three are in this condition.

Lagena marginato-perforata Seguenza.

Lagena marginato-perforata Seguenza, 1880, p. 332, pl. 17, fig. 34.

These vary a good deal in their contour. A few only have the keel fairly well developed.—*Locality :* Very rare at a few stations.

Another set is more elongate, and has the keel more developed at the base than at the sides. In some cases the centre of the test is free from markings.—*Locality :* It occurs at a good many stations, but is always rare.

Lagena radiato-marginata Parker and Jones.

Lagena radiato-marginata Parker and Jones, 1865, p. 355, pl. 18, figs. 3*a*, 3*b*.

There are thirty-two examples of this beautiful Lagena on the slide, and they are in perfect condition.—*Locality :* It occurs at various stations, but chiefly at Nos. **20, 21, 22.**

Lagena wrightiana Brady.

Lagena wrightiana Brady, *Quart. Journ. Micr. Sci.* vol. 21, 1881, p. 62.

Lagena wrightiana Brady, 1884, p. 482, pl. 61, figs. 6, 7.

Two or three only were found. They are small and are not in very good condition.—*Locality :* Uncertain.

Lagena lagenoides Williamson sp. (Pl. 18, figs. 22–29 and Pl. 19, figs. 1–3).

Entosolenia marginata (Walker and Boys) var. *lagenoides* Williamson, 1858, p. 11, pl. 1, figs. 25, 26.

There are a large number of the type and its variations. Both the long and short form, figured by Williamson, are present. One set has the tube straight, and another has it attached. Sometimes the tube is absent.

Pl. 18, fig. 22. This is the same as the one figured by Mr. Millett, 1901, p. 623, pl. 14, fig. 8, of which there are numerous examples. Mixed up with them is a rather smaller form, the wing of which is not so broad, but stouter, and therefore not so liable to become damaged. There is one specimen in the trigonal condition, found at No. **11**.—*Locality :* Chiefly Nos. **8, 11, 19, 22.**

Pl. 18, fig. 23. The keel, in this instance, splits half-way down the edge of the test and the space is filled with shell-growth or debris, from which in a few instances fine, hair-like spines project. This shell-growth, or débris, is not always confined to the split carina, but often spreads over the lower half of the test, and the delicate spines also appear. I presume that if the specimens were in perfect condition these spines would be very numerous. Tube attached.—*Locality :* Chiefly Nos. **1, 21, 29.**

Pl. 18, fig. 24. It may be that the carina has partially broken away, leaving the tubular portion intact. There are only two in this condition, the one not figured showing even less of the carina. The entosolenian tube is short and straight. — *Locality :* Nos. **11, 19.**

Pl. 18, fig. 25. The cellular carina is narrow, but comparatively stout, and is absent for a short distance on each side of the test. The internal tube is short and straight. Twenty-one are on the slide.—*Locality :* Chiefly at No. **11.** Very rare at Nos. **8, 12, 19.**

Pl. 18, fig. 26. The test is curiously contorted, especially the lower half of the carina, one side of which dips down suddenly at the base, thus causing the lower halves of the carina to lie in different planes. The keel itself seems inclined to be concave or convex, according as the edge is twisted upwards or downwards. It is a very delicate foraminifer and many of the specimens are fractured. The tube is attached. Seventeen occur.—*Locality :* Chiefly Nos. **11, 19.**

Pl. 18, fig. 27. There are five examples of this circular and entosolenian variety. The tube is curled back upon itself. The test is fairly well compressed.—*Locality :* Four were found at No. **19.**

On the same square are also five elongate specimens, but the cellular rim is of a different character and the internal tube is long and straight. The outline is that of an elongate *L. laevigata.*

Pl. 18, fig. 28. In this case very nearly the whole carina is double, and just wide enough to allow the opening of the cellular passages to be distinctly seen. The tube is twisted and turned to one side. Sixteen found.—*Locality :* Chiefly No. **19**.

Pl. 18, fig. 29. Two specimens only occur. In the one figured, the band at the edge is practically flush with the body of the test, in the other case it slightly projects.—*Locality :* Nos. **4, 13**.

There is a third test on the slide, in which the orifice is more produced and the carina is more distinctly double, the space being filled with shell-growth or granulated matter. In size and contour it is the same as the above.—*Locality :* No. **32**.

Pl. 19, fig. 1. Test a little compressed. Around its edge are two ridges, connected at regular intervals by cross-bars. In the centre, between the cross-bars, there is a circular depression, which is not the orifice of a large pore, though very likely the base of each depression is porous. Orifice circular. This solitary example might with almost equal propriety have been placed under *L. bicarinata.*—*Locality :* No. 30.

Pl. 19, fig. 2. The test is not much compressed. The entosolenian tube is straight.—*Locality :* Uncertain. Very rare.

Pl. 19, fig. 3. This is a very much compressed variety, and has a double row of pores showing round the edge of the test; these are separated by a ridge, so that with the two lateral carinae the test in a feeble way resembles *L. orbignyana*.

Mr. Morton, 1897, pl. 1, fig. 5, refers to numerous specimens found in marine clay, Maine, America, which appear to be much in the same condition.

Fig. 3*b* gives a fair representation of the edge of the test, as far as I can make it out.—*Locality :* No. **8**. Only one occurs.

Lagena lagenoides Williamson var. *tenuistriata* Brady (Pl. 19, figs. 4, 5).

Lagena tubulifera var. *tenuistriata* Brady, 1881, *Quart. Journ. Micr. Sci.*, vol. 21, N.S., p. 61.

Lagena lagenoides Williamson var. *tenuistriata* Brady, 1884, p. 479, pl. 60, figs. 11, 15, 16.

There is a large number of this handsome form, and it agrees best with the *Challenger* figure, pl. 60, fig. 11. Brady writes of the markings as "striae," and in most of these specimens they

consist of distinct "costae." There is a tendency in the central costae to run up the neck, and if they were a little more developed we should have the *L. quadralata* Brady. They are marked as occurring at fourteen stations.—*Locality :* Chiefly Nos. **1, 3, 11, 17, 31.**

Pl. 19, fig. 5. This is the trifacial form, of which only two specimens were found.

Lagena formosa Schwager (Pl. 19, figs. 6–9).

Lagena formosa (pars) Schwager, 1866, p. 206, pl. 4, fig. 19.
Lagena formosa (Schwager) Brady, 1884, p. 480, pl. 60, figs. 10, 18–20.

This seems to be an unsatisfactory species, and as Mr. Millett remarks in his Malay Report, 1901, p. 624 : "This species seems to differ from *L. lagenoides* only in the raised border which immediately surrounds the body of the test." In these gatherings there are over forty-five examples that agree fairly well with the *Challenger* figures, pl. 60, figs. 18–20, except that I cannot make out any punctate ornament on the raised border which surrounds the body of the test. When this does appear to be present, it seems to me that it is caused by the tubuli in the wing being seen through the raised border, which is transparent. In some of the examples the raised border is absent, except just at the base, and in others it is very feeble. The wing often splits as it approaches the base of the test, as shown in Pl. 19, fig. 6.—*Locality :* Chiefly Nos. **1, 3, 11, 17.**

Note.—The shape of the tests and their general appearance are so near to Brady's *Challenger* figures, that in spite of the absence of the punctate ornament they must be placed under *L. formosa.*

Pl. 19, fig. 7. Two specimens only, but they are large. They differ little from the preceding.

Pl. 19, fig. 8. In these the raised border is very slight, but is decorated as shown in the figure. The tube, when present, is attached. *Locality :* Over thirty were found at No. **11.** Very rare at several other stations.

Pl. 19, fig. 9. Test compressed. The wing that surrounds the body of the test gradually becomes less as it approaches the apiculate process at the base. The tubuli are confined to the

raised border, and set so close to each other that they give a frosted appearance to it. There is a space between the border and the wing. In a few cases the wing, or keel, dies away almost as soon as it reaches the body of the test. Over forty are on the slide. *Locality :* Chiefly Nos. **3, 7, 18, 26, 28, 30.**

Lagena formosa Schwager var. *comata* Brady (Pl. 19, figs. 10–12).

Lagena formosa var. *comata* Brady, 1884, p. 480, pl. 60, fig. 22.

Pl. 19, fig. 10. Bearing in mind the form of the test and the raised border, I think this may be looked upon as a weak form of *L. formosa* (Schwager) var *comata* Brady. There is a narrow space between the border and the keel, which often either splits towards the base or ends in tubular projections. The body is striated. All the tests are imperfect and the split wings are clogged with shell-growth. *Locality :* Chiefly Nos. **1, 2, 17, 18.** Frequent.

Pl. 19, fig. 11. The lower end of the test is only slightly compressed, but the compression becomes more marked as the orifice is approached. The keel, commencing at the orifice, becomes less pronounced as it proceeds towards the base. Surrounding the body of the test, on either face and at a short distance from the keel, is a raised border, perforated by tubuli. On both edges of the test there are two costae, one on either side of the keel, between it and the border. The tests are small and a good deal of shell-growth, or debris, is found on most of the examples between the costae, which interferes with their definition.—*Locality :* Nos. **3, 17, 19.** Rare.

Pl. 19, fig. 12. This appears to be the trigonal form of the above, and occurs more frequently and at numerous stations.—*Locality :* Nos. **1, 3, 9, 11, 19, 26**, and a few other stations.

Lagena orbignyana Seguenza sp.

Entosolenia marginata (pars) Williamson, 1858, p. 10, pl. 1, figs. 19, 20.

Fissurina orbignyana Seguenza, 1862, p. 66, pl. 2, figs. 25, 26.

This occurs in many forms, typical and otherwise, and at various stations.

Lagena orbignyana Seguenza, var. (Pl. 19, fig. 13).

There are about twenty on the slide and they are in the apiculate condition. In most cases, if not all, the apiculate process is tubular. The entosolenian tube is straight. In a few instances the orifice does not protrude, and in these cases the entosolenian tube is attached. *Locality :* Chiefly at No. **11**.

Lagena orbignyana Seguenza, var. (Pl. 19, fig. 14).

After very careful examination I believe this minute foraminifer to be feebly tricarinate. There seem to be traces of a central ridge. Both faces of the test are highly convex, and the basal spines are placed between the keels. It may be related to Mr. Millett's *L. orbignyana* var. *calcar* Millett, Malay Report, 1901, p. 626, pl. 14, fig. 18.—*Locality :* Uncertain.

Lagena orbignyana Seguenza var. nov. *coronata* (Pl. 6, fig. 15).

This beautiful specimen has a broad, opaque band encircling each face of the test, the central portion of the test being transparent. The chief keel is dentate at the base. One only occurs. —*Locality :* No. **23**.

Lagena orbignyana Seguenza var. *lacunata* Burrows and Holland (Pl. 19, figs. 16–18).

Lagena lacunata (Burrows and Holland) Jones, 1895, p. 205, pl. 7, fig. 12.

Pl. 19, fig. 16. In these specimens the depressions are well marked and their boundaries form an irregular, mesh-like pattern. The effect is very pretty, as the depressions are opaque and the mesh-work shows up dark. One specimen is in the trifacial condition.—*Locality :* Chiefly Nos. **1**, **2**, **19**. Frequent.

Pl. 19, figs. 17, 18. The markings are minute and in some cases seem to be the orifices of pores, but of this I am not certain. In the majority of cases the keels are feebly developed, and sometimes, as in fig. 18, they are hardly discernible. The entosolenian tube is straight.—*Locality :* Chiefly Nos. **19**, **21**.

Lagena orbignyana Seguenza var. nov. *stellata* (Pl. 19, fig. 19).

Test oval, tricarinate and apiculate. Orifice slightly protruding. Central portion of both faces of the test pitted and the remaining portion decorated with a series of fine arches. Entosolenian tube short and straight. The decoration is more delicate than shown in the illustration. Only a single example found. —*Locality :* No. **13.**

Lagena orbignyana Seguenza var. nov. *curvicostata* (Pl. 19, fig. 20).

The two side keels are recurved at the base and join the central keel, which is well developed. The decoration is a series of grooves, which are mostly bent as they approach the border and are sometimes irregular. Only one occurs.—*Locality :* Uncertain.

Lagena orbignyana Seguenza var. *walleriana* Wright (Pl. 19, fig. 21).

Lagena orbignyana var. *walleriana* Wright, 1886, *Proc. R. Irish Acad.*, ser. 2, vol. 4, p. 611, and 1891, p. 481, pl. 20, fig. 8.

The central "boss" is very slightly raised and surrounded by a ring. In some of the examples the "boss" is absent, but the ring is present. Over thirty are on the slide, and they are marked as occurring at eight stations.—*Locality :* Chiefly Nos. **8, 13, 19.**

Lagena orbignyana Seguenza var. nov. *unicostata* (Pl. 19, fig. 22).

In this variety there is a single costa running lengthwise down the centre of each face of the test. Ten occur and one is in the trifacial condition. In two other examples the costa is absent. —*Locality :* Three occur at No. **18.**

Lagena orbignyana Seguenza var. nov. *concentrica* (Pl. 19, fig. 23).

Test compressed. Central keel well developed. This solitary specimen has the faces of the test decorated with arched costae,

as shown in the drawing, but they are more delicate than indicated.—*Locality:* Uncertain.

Lagena orbignyana Seguenza var. *pulchella* Brady. (Pl. 19, fig. 24).

Lagena pulchella Brady, 1866, *Rept. Brit. Assoc.* (Nottingham), p. 70.

Lagena pulchella Brady, *Annals and Mag. Nat. Hist.*, 1870, p. 294, pl. 12, fig. 1.

The type form is present, but is very rare.

Pl. 19, fig. 24. This is a pretty, elongate variety. The markings are very delicate and irregular. About nine occur.—*Locality:* Chiefly No. **2**.

Lagena orbignyana Seguenza var. *clathrata* Brady.

Lagena clathrata Brady, 1884, p. 485, pl. 60, fig. 4.

The bold form, as figured in the *Challenger* Report, is not present, but many examples occur in which the keels are rather feebly developed. The costae are more numerous than in the type. Several specimens are in the trifacial condition.—*Locality:* Chiefly Nos. **1, 17, 18, 19**.

Lagena orbignyana Seguenza var. *variabilis* Wright.

Lagena orbignyana var. *variabilis* Wright, 1890, p. 482, pl. 20, fig. 9.

The type form is present, but is extremely rare.—*Locality:* Uncertain.

Small examples occur which are oval in outline, and, as in the type, the costae are confined to the lower part of the test. The trifacial form is present.—*Locality:* Chiefly Nos. **18, 19**. Rather rare.

Lagena orbignyana Seguenza (?) (Pl. 21, fig. 15).

The single keel, starting at the orifice, splits part way down, on both sides of the test, into three well-developed carinae, which are more or less serrated at the base.—*Locality:* Occurs at a good many stations, including Nos. **13, 17, 26.**

Lagena bicarinata Terquem sp. (Pl. 19, figs. 25–27, and Pl. 20, fig. 1).

Fissurina bicarinata Terquem, 1882, p. 31, pl. 1 (9), fig. 24.

Pl. 19, fig. 25. This occurs in two forms; frequently with no central ring, and very rarely with two, as in the type form. The two forms are mixed on the slide. Tube straight.—*Locality:* Chiefly Nos. **8, 11, 12, 19**.

Pl. 19, fig. 26. A few are in a spinous condition, as shown in the drawing. When these spines are present there is generally a certain amount of exogenous shell-growth. These specimens are mixed, on the slide, with the two above named.

Pl. 19, fig. 27. In this the keels are feebly developed and wide apart. The entosolenian tube is long, often sinuous, and is attached to the face of the test.—*Locality:* It occurs at Nos. **1, 17, 18, 19**, and a few other stations, but is always rare.

Other forms occur, some very large and others small, some with long necks and some without any.

Pl. 20, fig. 1. The body of the test is much more compressed near the commencement of the neck than at the base, and the side wings which spring from the neck split and join the ridges that surround the body.—*Locality:* No. **19**. It is rare.

Lagena bicarinata Terquem var. nov. *imbricata* (Pl. 20, fig. 2).

Projecting from the two ridges that surround the body of the test on both faces is a series of short cross-bars that reaches half-way across the edge of the test. Generally these cross-bars are placed alternately and the spaces between are filled with shell-growth. The internal tube is attached. Only one found. On the same square is another solitary specimen, similar, except that between the ridges surrounding the body there are two extra ridges, and the cross-bars appear to be confined to the outer portion.—*Locality:* The two specimens are marked from No. **19** and No. **20**, but to which station each belongs is uncertain.

Lagena bicarinata Terquem var. nov. *horrida* (Pl. 20, fig. 3).

This fine specimen has the keels set well apart, right up to the edge of the orifice. The space between them is filled with shell-

growth, from which project innumerable fine spines.—*Locality :* No. **19.**

On the same square are several very similar specimens, but the double carina is confined to the body of the test; there are no spines showing, and the keels are not placed so far apart.

Lagena auriculata Brady (Pl. 20, figs. 4–14).

Lagena auriculata Brady, 1881, *Quart. Journ. Micr. Sci.*, vol. 21, N.S., p. 61.

Lagena auriculata Brady, 1884, p. 487, pl. 60, figs. 29, 33 and 31 (?).

In these soundings this species is subject to extraordinary variation. The specimens form a most interesting series, eight of which resemble Brady's *Challenger* illustration, pl. 60, fig. 33.—*Locality :* No. **29.**

Pl. 20, fig. 4. This is the same as the above, excepting that there is a flange projecting at the base, on both sides of the test.—*Locality :* No. **19.** Only one occurs.

Pl. 20, fig. 5. In this the body is elongate, with a long neck, and the loop-shaped, laminar process on either side of the base is lengthened and narrowed, until it becomes more of a tube than is the case with the type form. Only three or four occur, and in one or two of them the tubular extensions are rather wider than in the one figured. The tests are compressed.—*Locality :* Two occur at No. **9.**

Pl. 20, fig. 6. This is very similar to the one figured by Mr. Millett, in his Malay Report, 1901, Pl. 14, fig. **15.** Rather rare. —*Locality :* These specimens are mixed with those of other species and so the exact locality is uncertain.

Pl. 20, figs. 7, 8. These are similar to the *Challenger* figure, pl. 60, fig. 29. The examples vary both in size and in the amount of compression of the basal extensions. The internal tube is straight. About thirty-eight occur.—*Locality :* Nos. **3, 13, 26,** and many others.

Pl. 20, figs. 9, 10 (round in section). As some of the well-known Lagenae, which are typically round in section, have also their compressed form, so one would expect that some of those which are typically compressed would be occasionally represented by specimens which are round in section. Such is the case with these. The tube is free and much twisted.—*Locality :* It occurs at thirteen stations, but chiefly at Nos. **1, 23.** Always rare.

Pl. 20, fig. 11. There are only two or three of this minute form. The tube is attached and the test well compressed.—*Locality :* Exact locality uncertain.

Pl. 20, fig. 12. In these the tubular processes at the base are comparatively long. The entosolenian tube is long, more or less attached, and curled back after nearing the base of the test. Aperture compressed. About thirty are on the slide.—*Locality :* Chiefly at No. **1**. Rare at Nos. **3, 9, 14, 25**.

At No. **11** nine occur of the same outline, but the tubular processes only just project and the internal tube is much shorter.

Pl. 20, figs. 13, 14. Mr. Millett in his Malay Report, 1901, pl. 14, figs. 14, 16, only figures the contorted and trifacial form of this beautiful variety of *L. auriculata*. Fig. 13 represents the variety in its normal condition and there are forty-seven on the slide.—*Locality :* Chiefly Nos. **1, 11, 19, 21**. Fig. 14 is the contorted form. None of the examples show the "auricular" portion carried so far up towards the neck as is represented in Mr. Millett's figure.—*Locality :* Chiefly Nos. **1, 11, 19, 21**. Thirty occur.

Lagena auriculata Brady var. (Pl. 20, figs. 15–18).

Pl. 20, fig. 15. The test is generally slightly roughened and the tube is attached. The body of the test is circular, or ovate, and compressed. The drawing is taken from the largest of the specimens. Several of the smallest have the orifice opening forwards.—*Locality :* Chiefly at No. **32**, and rarely at several other stations.

Pl. 20, fig. 16. A solitary specimen, in which the outline of the carina is nearly square.—*Locality :* Station uncertain.

Pl. 20, fig. 17. There are several examples in which the carina stops short of the tubular processes, or only just reaches them.

Pl. 20, fig. 18. In these the carina is confined to the base of the test and the entosolenian tube is of extraordinary length.—*Locality :* Chiefly No. **19**. Very rare.

Lagena auriculata Brady var. nov. *arcuata* (Pl. 20, figs. 19, 20.

The costae at the lower end of the test form a series of tall arches. In one or two instances the base between the tubular projections is armed with a long spine. The examples are small,

and are marked as occurring at eight stations, but being mixed with those of another species the stations are uncertain. It occurs at any rate at No. **9**. The internal tube is attached.

Pl. 20, fig. 20. There are one or two specimens in which the costae do not become arched, and I take them to be feeble examples of the above. It is possible that they may be a weak form of *L. auriculata* var. *costata* Brady, 1884, pl. 60, fig. 38.

Lagena auriculata Brady var. *costata* Brady (Pl. 20, figs. 21, 22).

Lagena auriculata Brady var. *costata* Brady, 1884, pl. 60, fig. 38.

Except that the costae are more numerous and the tubular processes narrower, the specimens agree fairly well with Brady's description of the species.—*Locality :* Uncertain.

Lagena auriculata Brady var. nov. *duplicata* (Pl. 20, fig. 23).

In this case, instead of there being only two tubular processes at the base of the test, there are four, two on either side of the carina. It might be looked upon as a variety of *L. alveolata* var. *substriata* Brady, but the basal extensions are more characteristic of *L. auriculata*. Three found.—*Locality :* Nos. **10**, **17**.

Lagena fimbriata Brady (Pl. 20, figs. 24–26).

Lagena fimbriata Brady, *Quart. Journ. Micr. Sci.*, vol. 21, N.S., 1881, p. 61.
Lagena fimbriata Brady, 1884, p. 486, pl. 60, figs. 26–28.

There is a single fractured specimen similar to the *Challenger* illustration, pl. 60, fig. 28.—*Locality :* Uncertain.

Pl. 20, figs. 24, 25. These come pretty near to the *Challenger* example, pl. 60, fig. 27. Most of the specimens are not quite so broad as the one figured. Owing to debris, or shell-growth, clogging the enclosed space at the base, I cannot be quite certain if the walls are traversed by tubuli; at any rate, they are often crinkled. There is no entosolenian tube. Nineteen occur.—*Locality :* Fig. 24, chiefly at Nos. **3**, **9**. Fig. 25, only three found, No. **28**.

Pl. 20, fig. 26. In the *Challenger* Report Brady gives no detailed description of his fig. 26, pl. 60, but his drawing shows a series of

spines at the base, although one cannot be certain if they are intended to be on the edge of the oval wing surrounding the base. I should have taken them to be on the edge but that all the specimens in these gatherings show the spines running in a line from one side to the other through the centre of the enclosed space. It is obvious, I think, that the specimens are the same as the one figured by Brady. Upon examination the base of the test turns out to be very complex. There are two large specimens in this set of gatherings, one of which is in fine condition; and after comparing these with others from a different set of soundings, it is possible to come to a fairly accurate conclusion as to the nature of the complex base. As stated before, the spinous ridge runs from side to side through the centre. There appears to be a small, oval ridge placed centrally, as shown in the drawing, fig. 26*b*, and from this a series of closely set plates, standing on edge, radiates all round as far as the outer oval wing. The spaces between the plates are nearly always filled with granular shell-growth. A few small doubtful examples also occur.—*Locality :* Nos. **9, 17**.

Lagena fimbriata Brady var. nov. *occlusa* (Pl. 20, figs. 27, 28).

There are numerous examples of this elongate variety, some of which are much more compressed than the one figured, while others are broader as compared with their length. The entosolenian tube is long and has a coil in it near the orifice. The opening at the base is often nearly closed. The aboral wing is semi-opaque and wrinkled, but the opaqueness may be due to the granular shell-growth, or debris, with which the enclosed space is blocked. I cannot be certain if this basal compressed wing is traversed by tubuli. The orifice appears to be small and circular.—*Locality :* Occurs at many stations, chiefly Nos. **1, 6, 13, 18, 28, 32**.

Pl. 20, fig. 28. Of this short form, which I think may be taken as a variation of the above, there are only three or four examples.—*Locality :* Uncertain.

Lagena fimbriata Brady (?) (Pl. 21, fig. 17).

The body of the test is nearly circular in outline and compressed. The long neck is supported on either side by a wing.

At the base there is an oval flange, which projects more especially at the sides. This is a provisional description of the form, as the specimen may be in an imperfect condition. It is the best example on the slide.—*Locality :* Six are marked as being found at No. **11.**

Lagena alveolata Brady (Pl. 21, figs. 1, 2).

Lagena alveolata Brady, 1884, p. 487, pl. 60, figs. 30, 32.

Pl. 21, fig. 1. The tests vary a good deal in outline, but the majority are pyriform. The two lateral carinae, which unite with the median to form the loops at the base, are rough, or striated, and frequently drawn together so that the openings are nearly closed. The tube is straight.—*Locality :* Chiefly No. **32.** It occurs rarely at a good many stations.

Pl. 21, fig. 2. There are three fine specimens which are only very slightly compressed, and the division between the loops on each face of the test is very small.

Pl. 21, fig. 2*b* shows the base, its divisions being filled with granular matter. I think it probable that the walls at the base are partially broken down.—*Locality :* Uncertain.

Lagena alveolata Brady var. nov. *carinata* (Pl. 21, fig. 3).

This differs from the type in that the test is carinate. One example is in the trifacial condition.—*Locality :* Chiefly Nos. **6, 7, 18.**

Lagena alveolata Brady var. *substriata* Brady.

Lagena auriculata var. *substriata* Brady, 1881, *Quart. Journ. Micr. Sci.*, vol. 21, N.S., p. 61.

Lagena alveolata var. *substriata* Brady, 1884, p. 488, pl. 60, fig. 34.

Two only occur.— *Locality :* Nos. **30, 34.**

Lagena alveolata Brady var. *caudigera* Brady (Pl. 21, fig. 4).

Lagena alveolata var. *caudigera* Brady, 1884, p. 488, pl. 60, fig. 25.

Although the specimen shows signs of wear in the region of the loops, I think there is no doubt that it is rightly placed under this heading. One only found.—*Locality :* No. **29.**

Lagena alveolata Brady var. nov. *separans* (Pl. 21, fig. 5).

Test compressed, almost circular in outline, ovate, or pyriform. Four independent, narrow loops at the base, two on either side. Entosolenian tube short and coiled. Orifice rather compressed.

I think this interesting form should be treated as a variant of *L. alveolata*, rather than as one of *L. auriculata*, the two loops on either side of the base being separated. The type form is "furnished with a median and two lateral carinae, which unite to form two loops on either side of the test." There are over forty on the slide.—*Locality:* Chiefly Nos. **3, 13, 17, 18, 28, 30, 32.**

Lagena clypeato-marginata Rymer Jones var. (Pl. 21, fig. 6).

Lagena vulgaris Williamson var. *clypeato-marginata* Rymer Jones, 1872, p. 58, pl. 19, fig. 37.

Although not quite typical, I think the specimens may come under this heading. There are no spines and the base of the chief keel is not always serrated. Some of the specimens have the space between the orifice and the body of the test shorter, and the keel at the base more rounded off, than in the one figured. Eight found.—*Locality:* Nos. **8, 14**, and several other stations.

Lagena clypeato-marginata Rymer Jones var. nov. *crassa* (Pl. 21, fig. 7).

Of this very robust variety there are only two specimens, and they are in good condition. The neck is decorated with four stout costae, two on either side. The lower part of the body of the test is pitted, in most cases irregularly, but sometimes the markings are arranged in lines. The lower edge of the pitted portion projects as a flange.—*Locality:* Nos. **3, 14.**

Lagena magnifica sp. nov. (Pl. 21, fig. 8).

Test compressed, occasionally round in section. The neck is long and the orifice phialine. The base is apiculate and there are two spines, one on either side of the apiculate process. The body of the test is covered at regular intervals with short, blunt,

tubular spines, each of which has its orifice minutely phialine. Running round the edge of the test are three or four rows of the spines, which are sometimes connected so as to form a ridge. The orifices of the spines show quite distinctly under a magnification of seventy-five diameters. The test when fresh is semi-transparent, but most of the specimens are opaque and roughened by granular shell-growth, which fills up the spaces between the tubular spines. There are twenty on the slide, one or two of which are round in section, or nearly so. This form may be related to *L. hispida*, which, though typically round in section, occurs also in the compressed condition, but the nature of the spines is distinctly different.—*Locality:* Eleven found at No. **1**, two at No. **18**, three at No. **30**, and odd ones at a few other stations.

Lagena elcockiana Millett (Pl. 21, fig. 9).

Lagena elcockiana Millett, 1901, p. 621, pl. 14, figs. 5, 6.

There were twelve specimens on the slide, but there are only two now, owing to an unfortunate accident. They were all similar to the one figured. Mr. Millett states that it is rare in the Malay Archipelago and only found at a few stations in Area 2.—*Locality:* One found at No. **18**, ten at No. **19**, and one at No. **20**.

Lagena soleaformis sp. nov. (Pl. 21, fig. 10).

This is a difficult Lagena to describe. Taking as the front of the test that side which shows the orifice of the attached, entosolenian tube, we are reminded of a horse-shoe. The carina is slightly convex on the front and concave at the back. The central portion (the body of the test) is flattened, and slopes backwards at the base, but the back is highly convex and produced at the base as a curved flange. Eight found.—*Locality:* Six at No. **19**, one at No. **20**, and one at No. **21**.

Lagena galeaformis sp. nov. (Pl. 21, figs. 11, 12).

Test nearly square in section. It is carinate at the angles, and broader at the base than at the orifice, which is square. A

tubular process projects at each corner of the base. The body of the test is covered with fine, broken-up striae.

I believe the type form to be four-sided, as it occurs very rarely in the trifacial condition (see fig. 12).—*Locality*: Chiefly Nos. **1, 13, 17, 19.**

Note.—There are a few of the three-sided ones in which the tubular processes are absent, but they appear to belong to the same set.

Lagena semicostata sp. nov. (Pl. 21, fig. 13).

Test compressed, irregularly ovate, the upper part squared off at the sides. The entosolenian tube is straight. A series of very fine, curving costae, running parallel to each other, partially encircles the sides and lower half of the test. At the base, on either side, is a ridge that divides the curving costae into two sets. Only one found.—*Locality*: No. **34.**

Lagena sacculiformis sp. nov. (Pl. 21, fig. 14).

Test oblong, apiculate, asymmetrical, one side being very convex, the other only slightly so, and always having a compressed part at the centre of the slightly convex side. Orifice at the end of a short neck, which is placed at the junction of the two sides. There is no internal tube, and the surface of the shell is smooth and polished.—*Locality*: One found at No. **2,** one at No. **11,** and five at No. **19.**

Lagena protea Chaster.

Lagena protea Chaster, 1892, p. 62, pl. 1, fig. 14.

Nineteen are marked on the Chart, and they vary in size and shape. There can be little doubt that this form is generally adherent. After studying the large numbers that have come under my observation from many localities, I am of opinion that Dr. Chaster was right in treating them as true Lagenae.

In a letter dated from Southport, February 8th, 1897, he wrote me as follows, and I know that up to the time of his death he had not changed his opinion:

"I note your remarks upon my *Lagena protea*. That Messrs.

Jones and Chapman are utterly in error in referring my specimens to Ramulina is a matter quite beyond doubt. As genera and species in the Foraminifera go, they have nothing whatever in common beyond a superficial resemblance. *L. protea* always has but a single chamber and a single aperture. Now, Ramulina fragments have always several open tubular projections, or when much broken the corresponding apertures are left. It might be urged that *L. protea* is the initial chamber of Ramulina. This is disproved by the absence of Ramulina in dredgings where *L. protea* is abundant, and still more conclusively by the fact that the initial chamber of Ramulina is known. Schlumberger has found perfect specimens of *R. grimaldii* Schlumberger. These commence, as one would expect, as a Polymorphina, and afterwards take on the ramuline growth. Ramulina may, indeed, be considered as one of the fistulose Polymorphinae, and is to my mind one of the genera that might well be dropped. I have found *L. protea* in profusion, have examined specimens with great care, and can positively pronounce them to be true Lagenae, and not the young or imperfect examples of anything else. Any one who will examine my series, yours, or take the trouble to hunt out a sufficient number of examples for himself, will come to the same conclusion. The specimens vary considerably, and it would not be difficult to make a series of all intermediate gradations between *L. protea* and *L. laevis*. This, however, is the case with many or most 'species.' I am sorry to have to differ from other authorities, but when, after the exercise of every caution, I find I am right, there is no other course, especially as the others do not appear to have anything beyond a vague surmise on which to base their opinion."

There is no doubt great difficulty in distinguishing abnormal examples of *L. hispida* Reuss from some of the forms of *L. protea*. —*Locality:* Chiefly Nos. **1**, **19**, **29**.

DESCRIPTION OF PLATES.

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Plate 15.

Plate 16.

Plate 17.

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Plate 19.

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22.	*L. orbignyana* Seguenza var. nov. *unicostata*, × 75	—
23.	*L. orbignyana* Seguenza var. nov. *concentrica*, × 115	—
24.	*L. orbignyana* Seguenza var. *pulchella* Brady, × 75	418
25–27.	*L. bicarinata* Terquem sp., × 75	419

Plate 20.

Plate 21.

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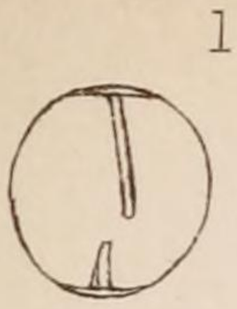
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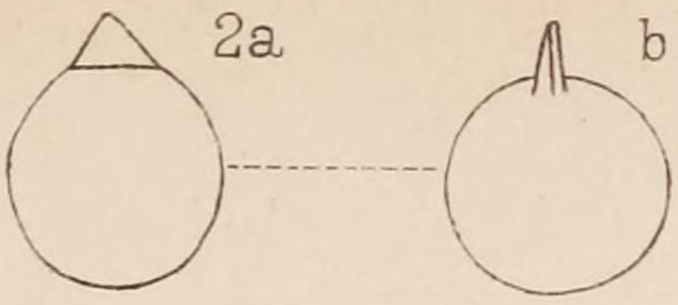
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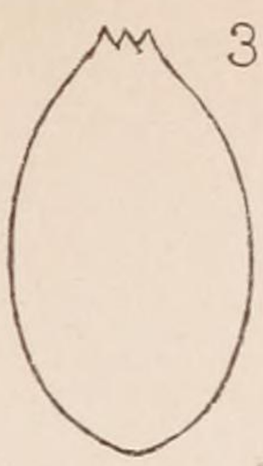
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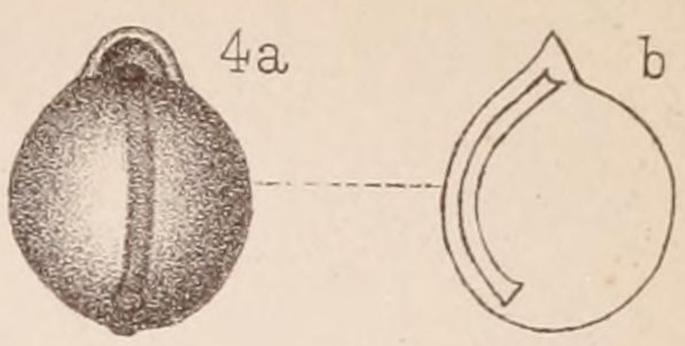
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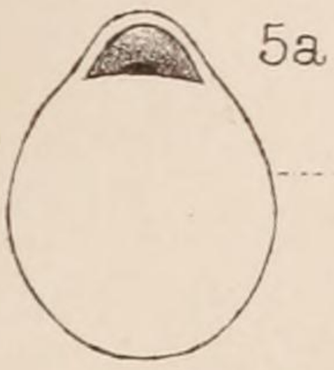
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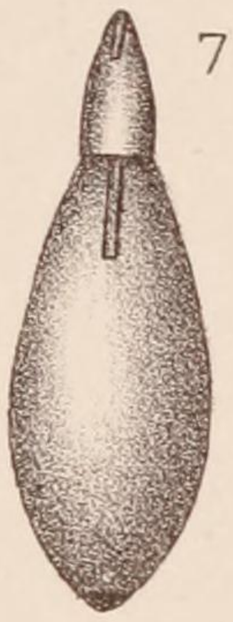
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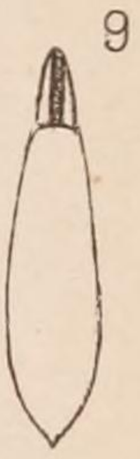
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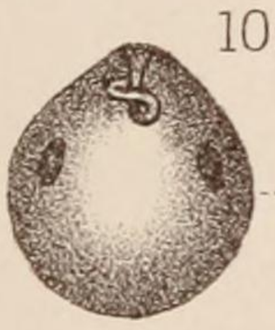
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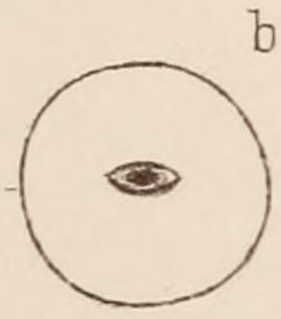
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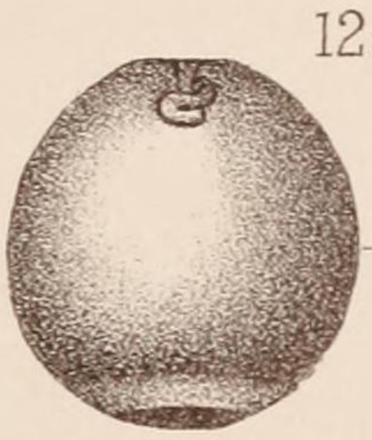
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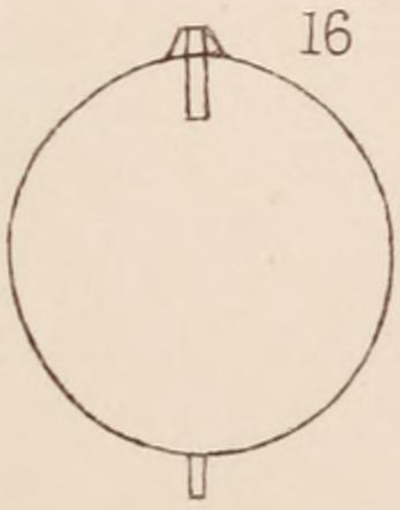
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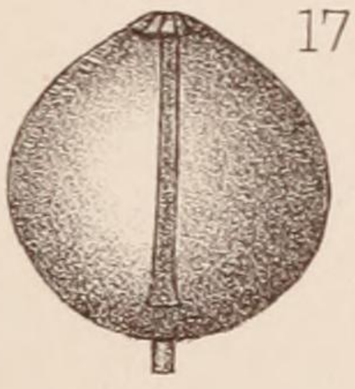
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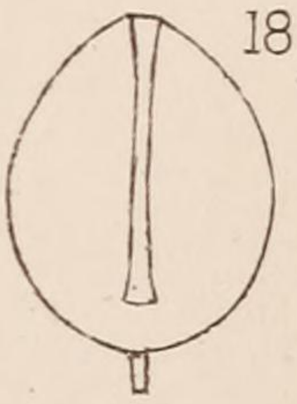
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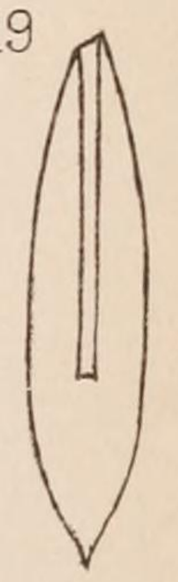
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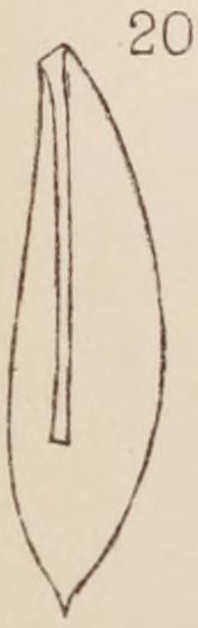
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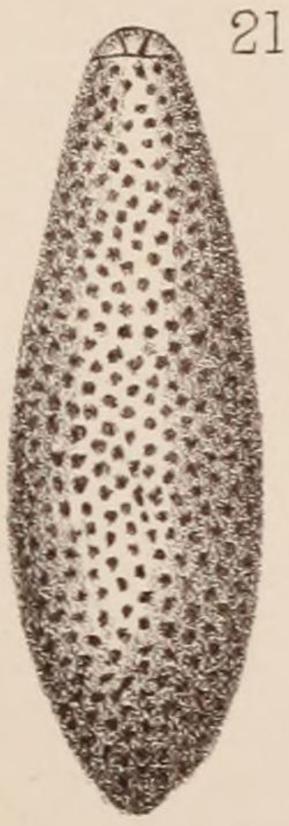
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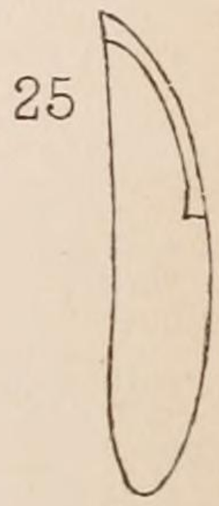
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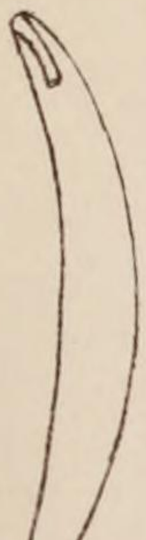
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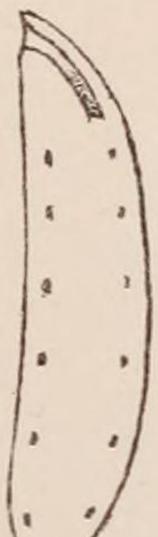
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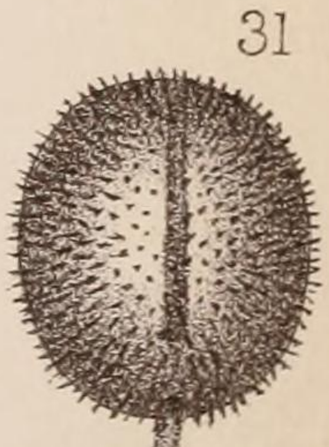
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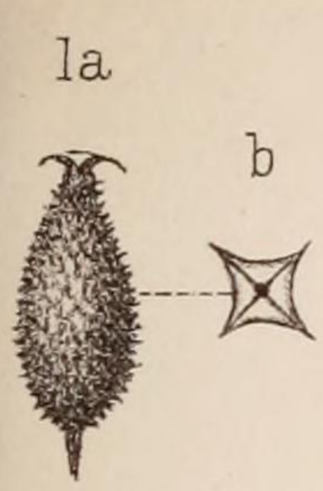
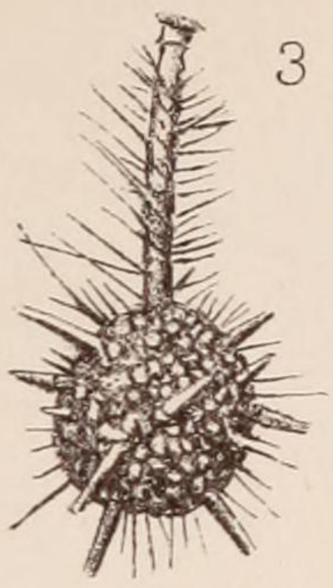
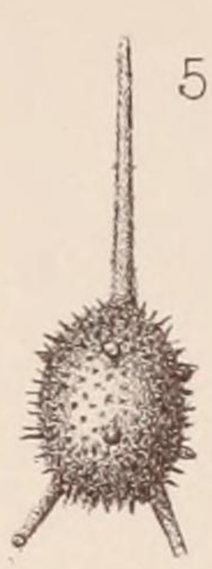
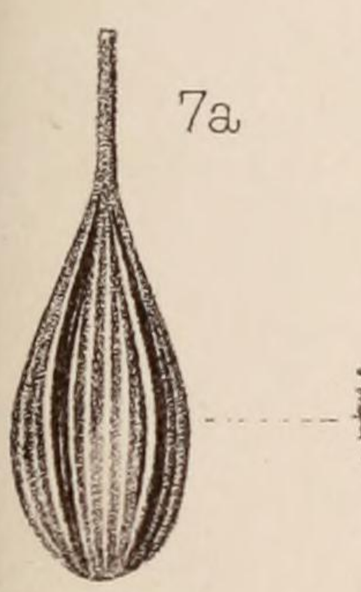
H. Sidebottom del ad nat. West, Newman lith.

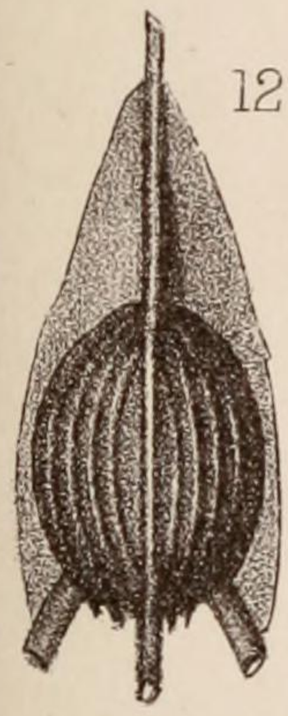
Lagenae of the South West Pacific Ocean.

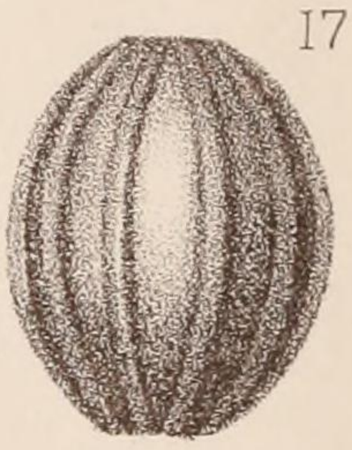


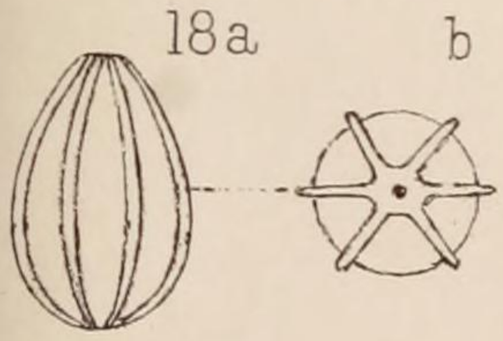


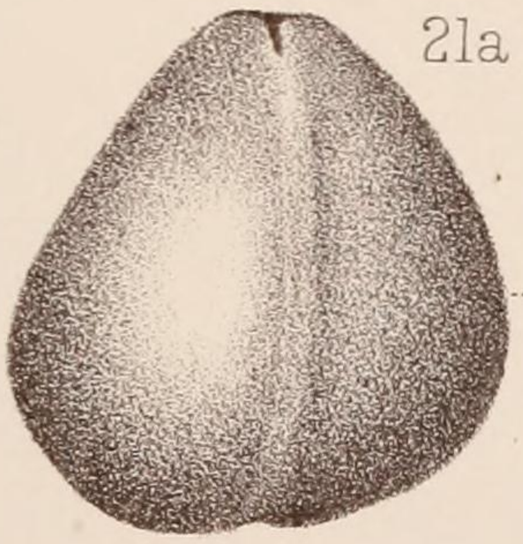


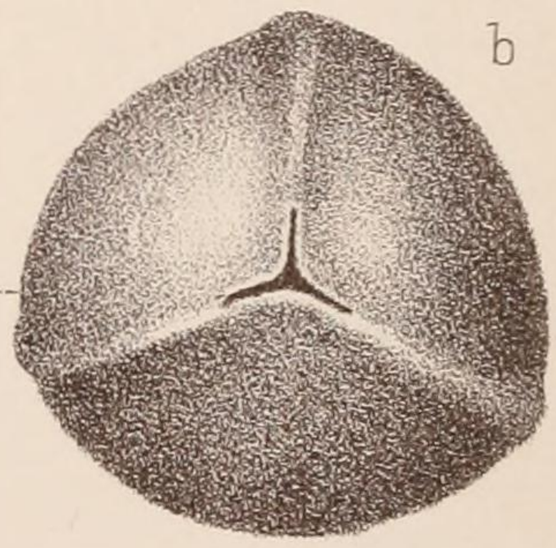


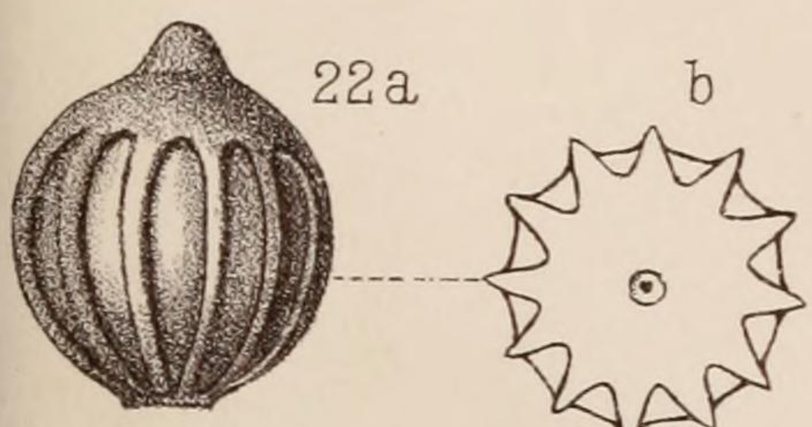


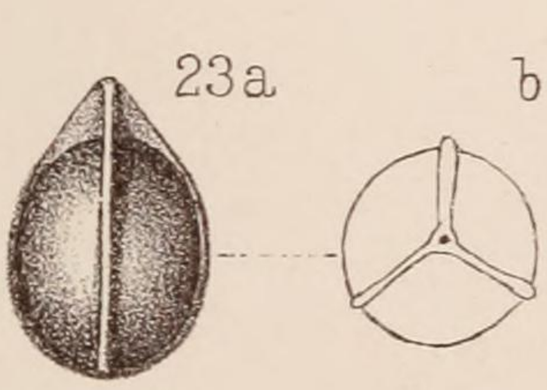


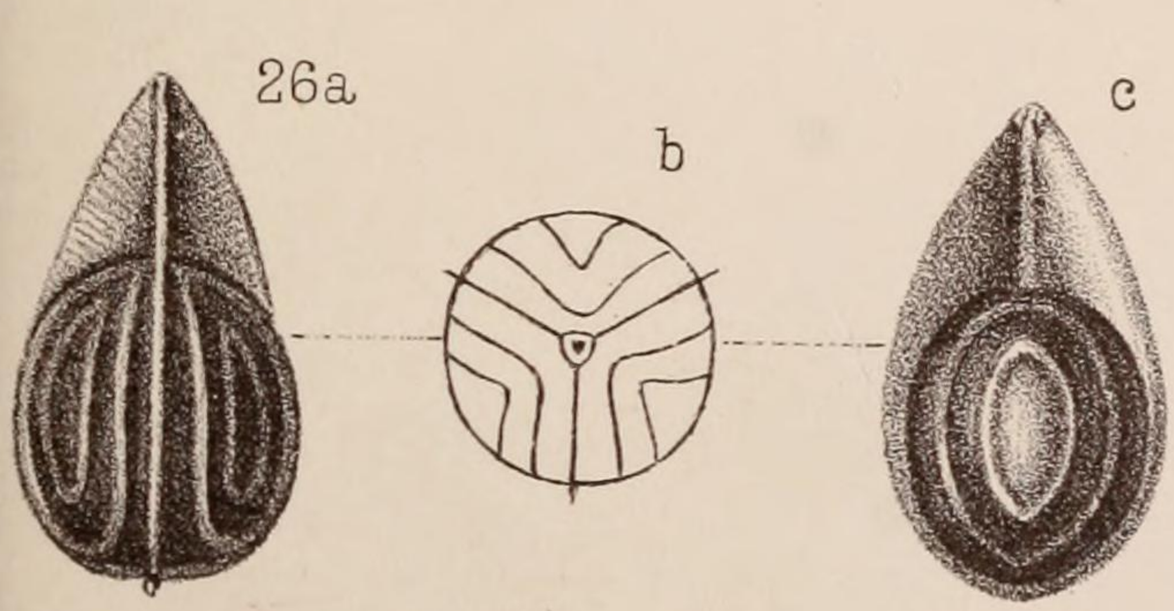


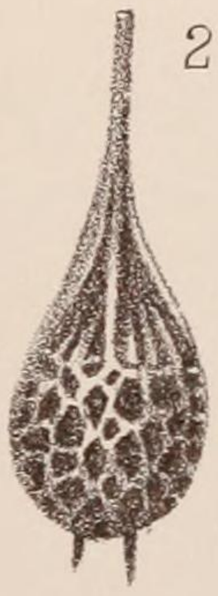


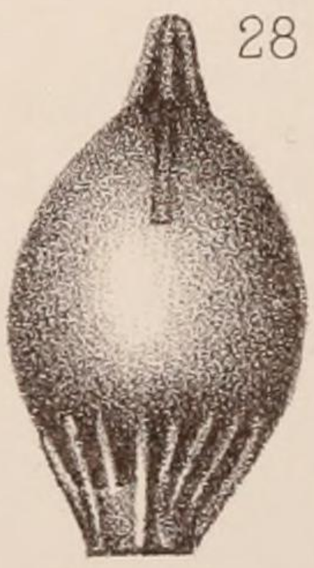






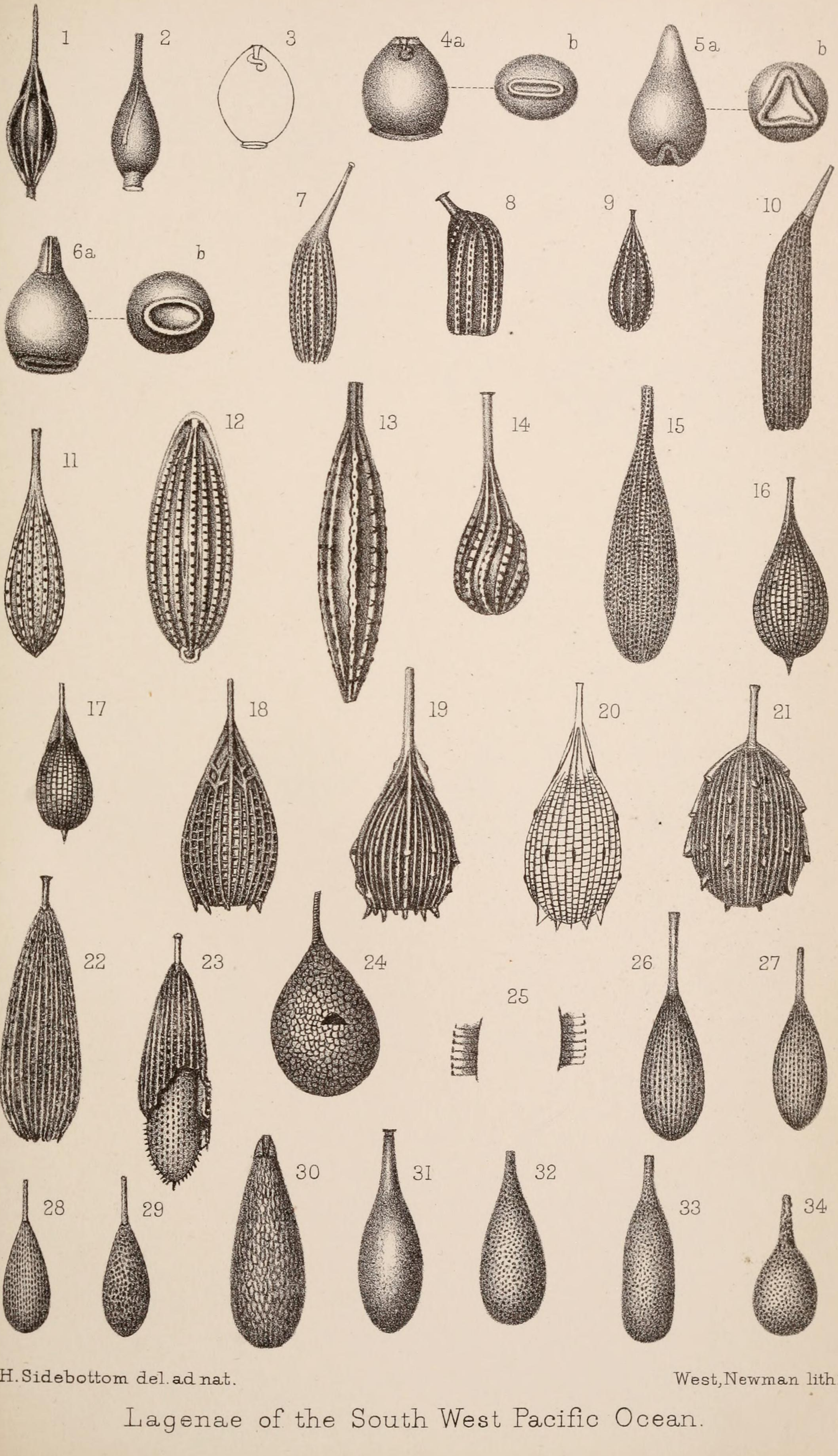






H. Sidebottom del. ad nat. West, Newman lith.

Lagenae of the South West Pacific Ocean.



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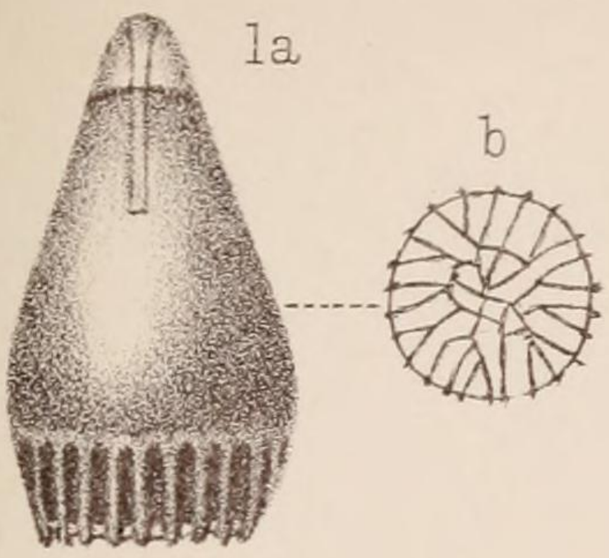
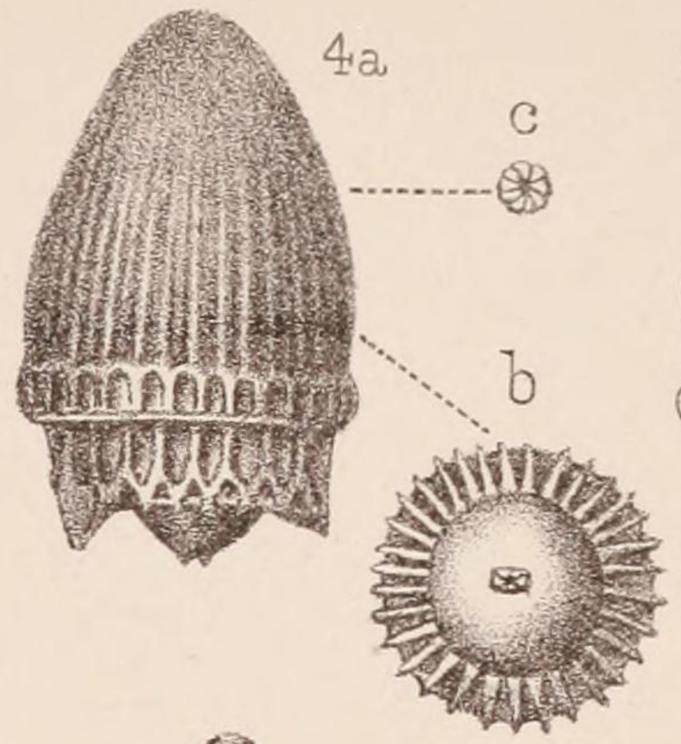
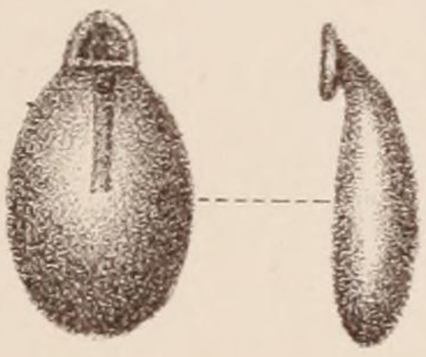
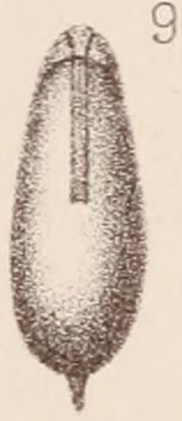
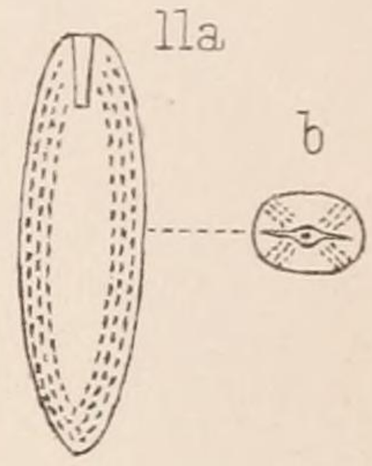
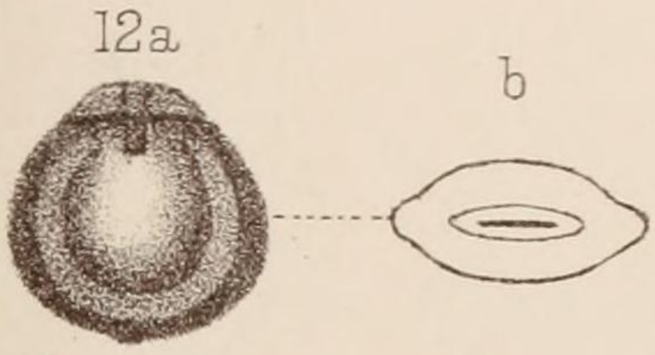


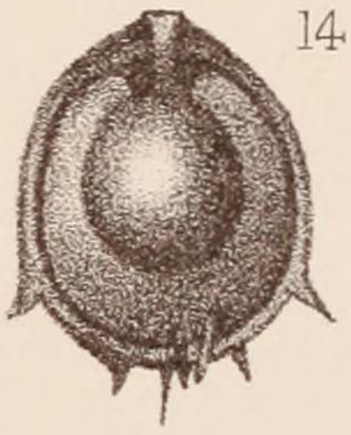


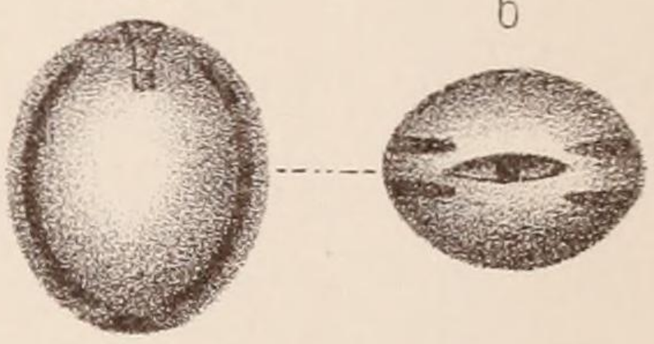


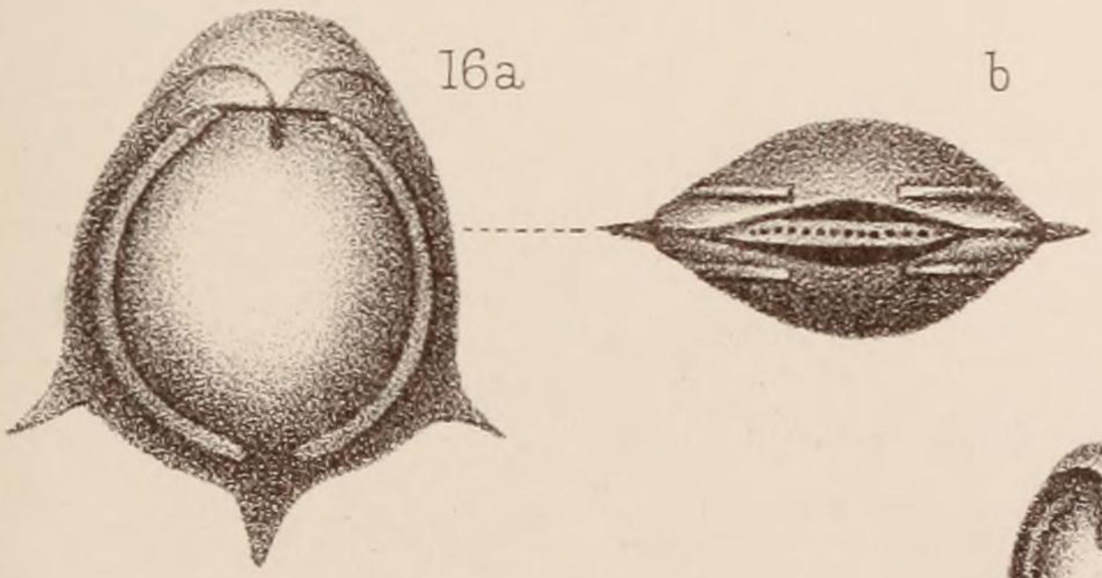


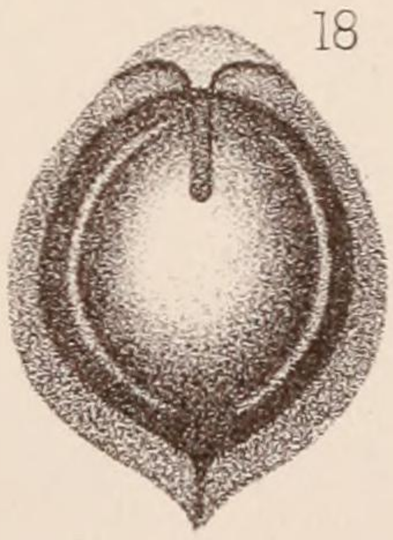


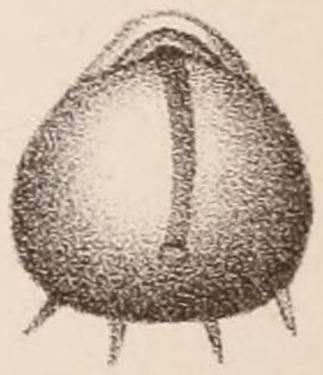


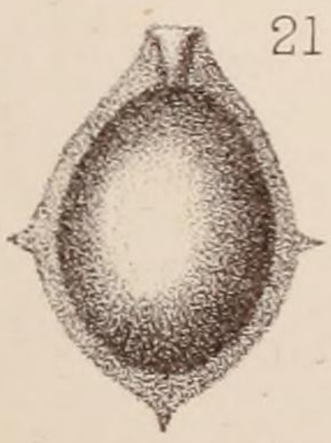


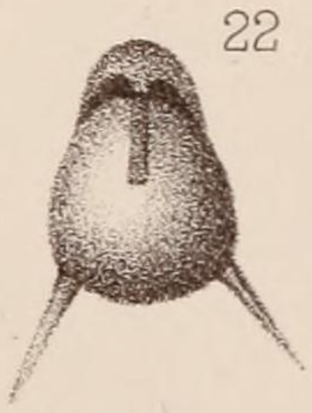


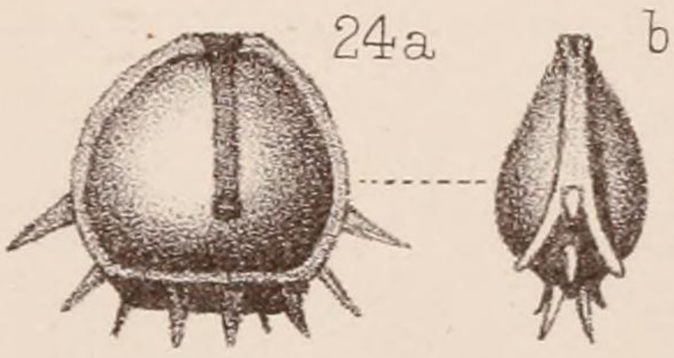


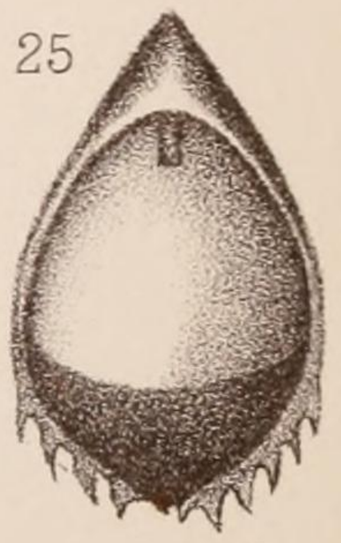


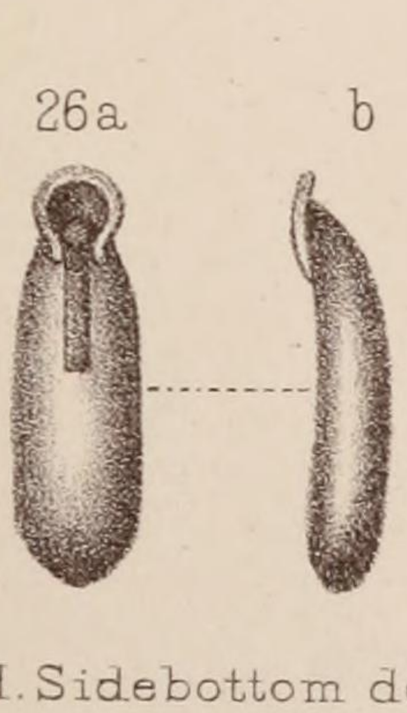


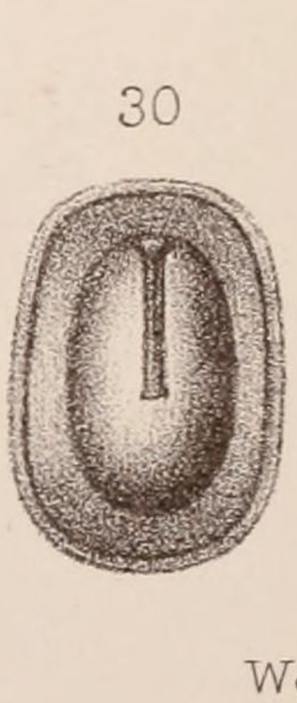


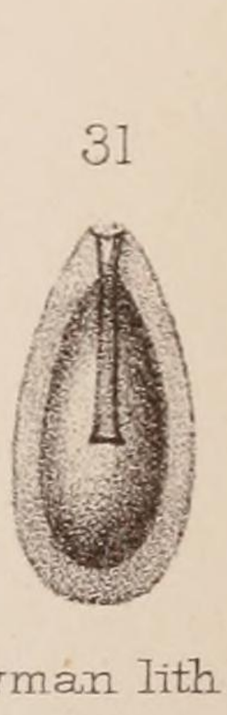








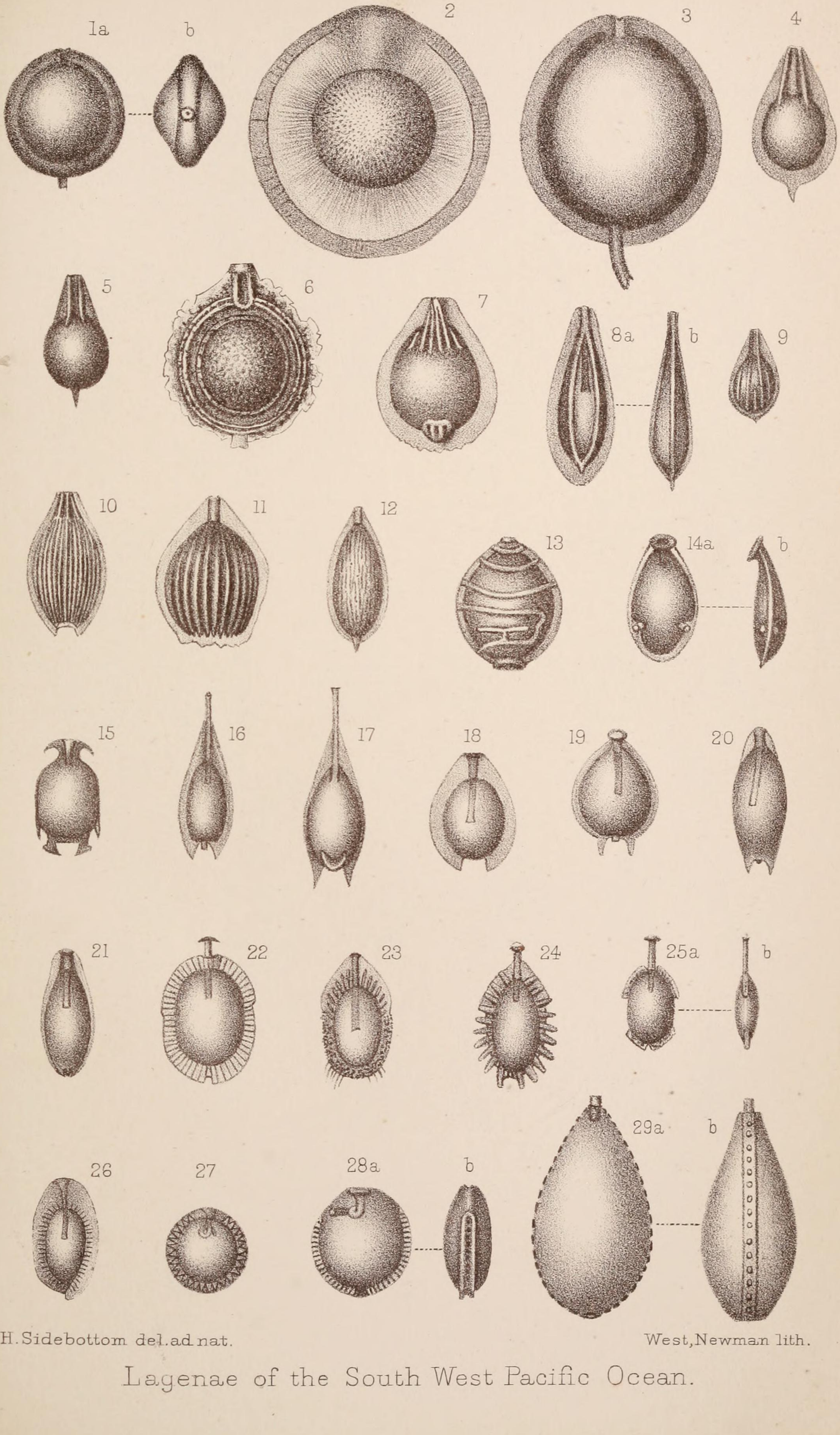




H. Sidebottom del. ad nat.

West, Newman lith.

Lagenae of the South West Pacific Ocean.



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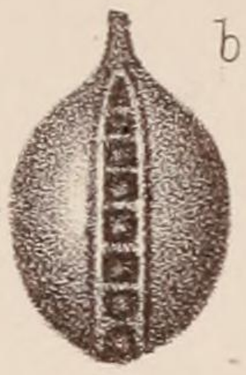
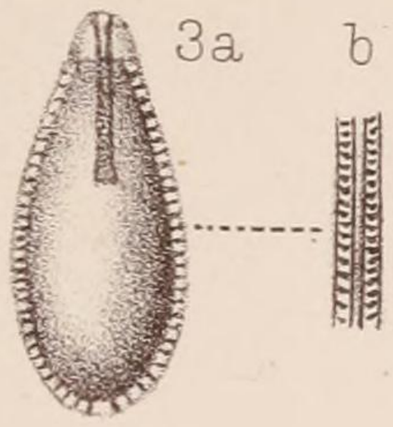
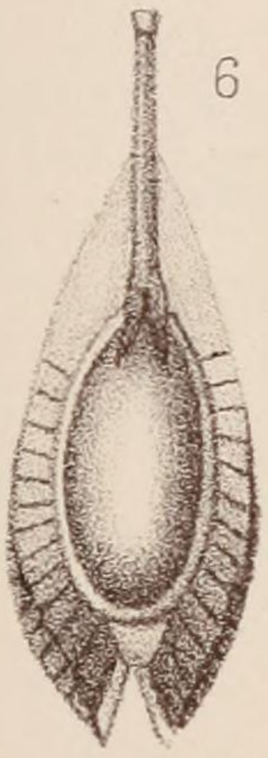
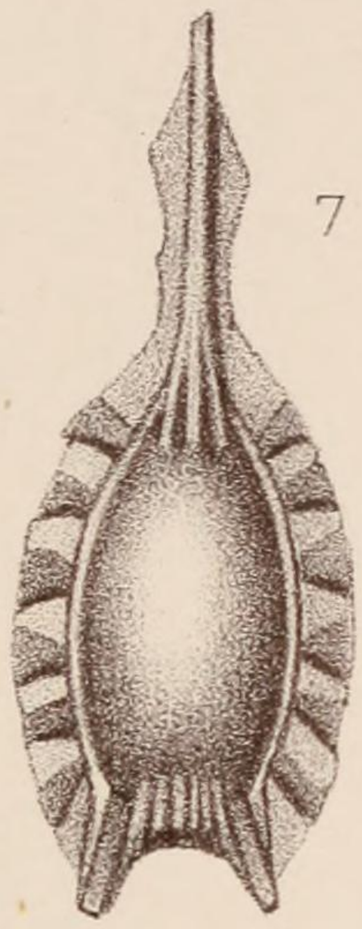
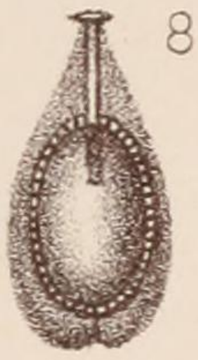
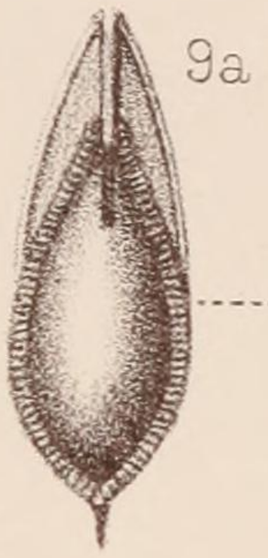


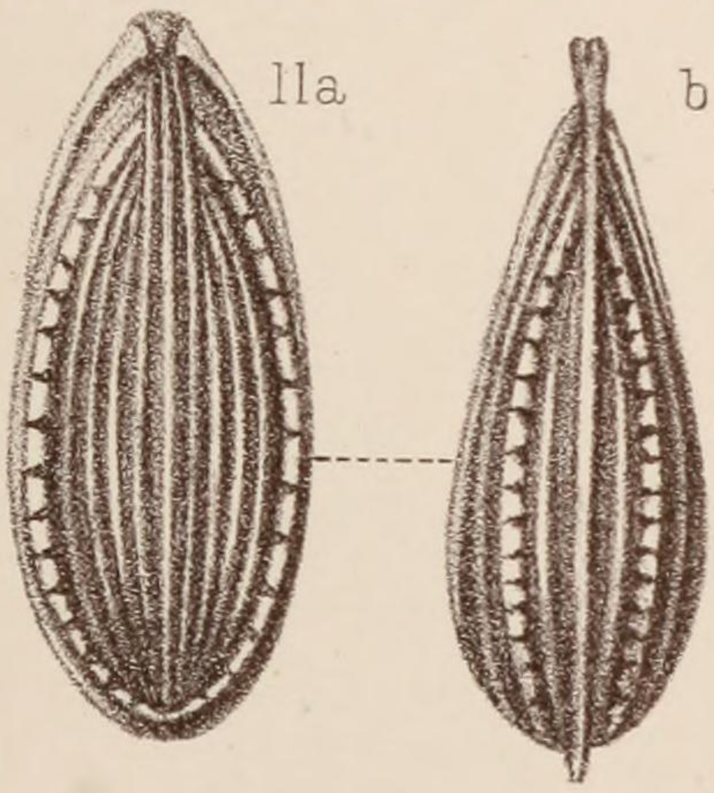


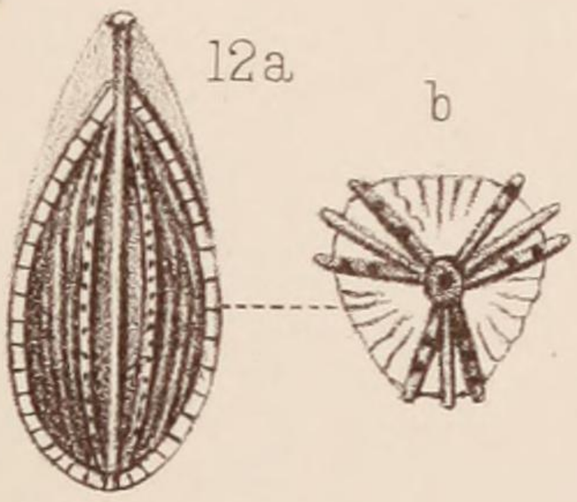


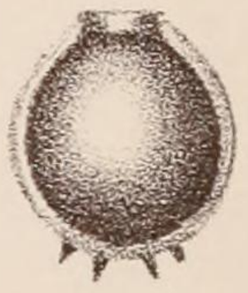


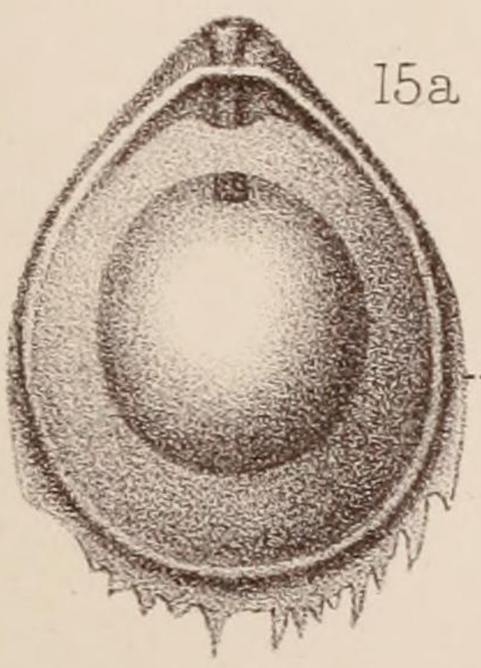


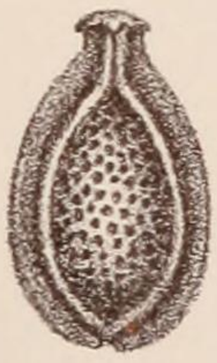


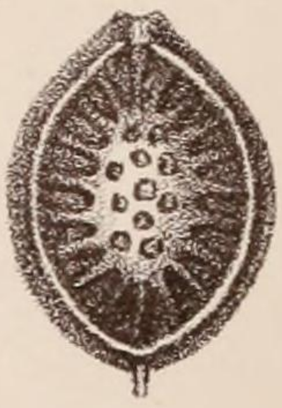


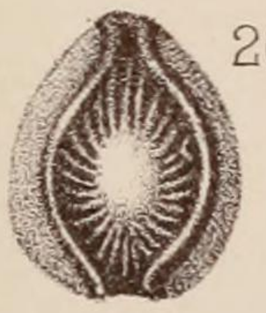


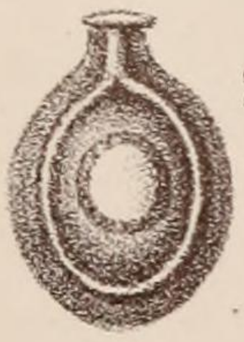


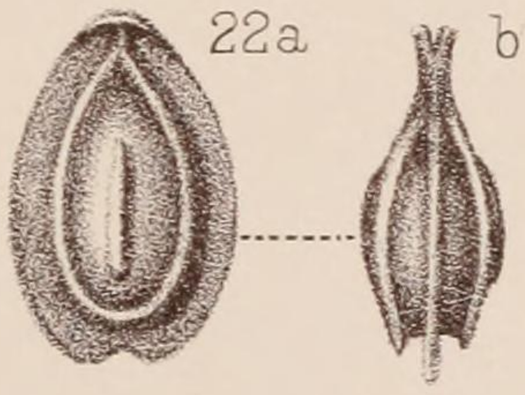


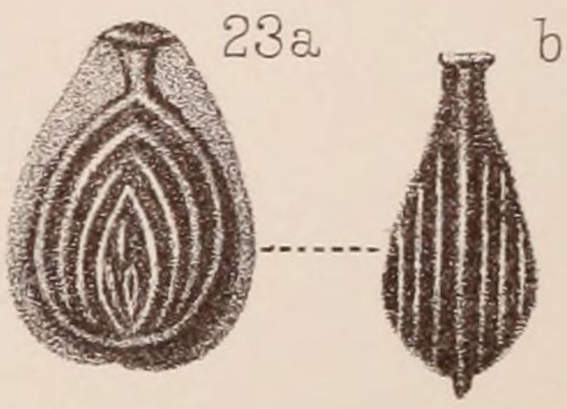


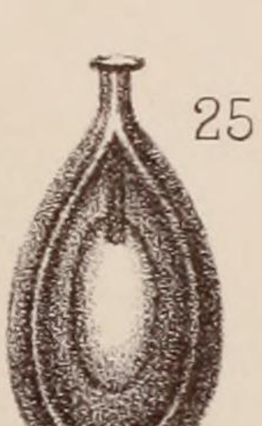


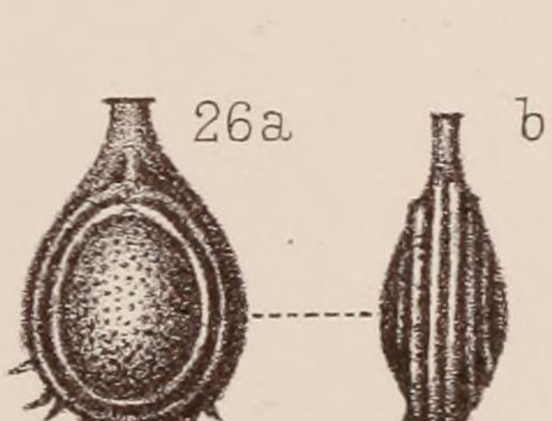


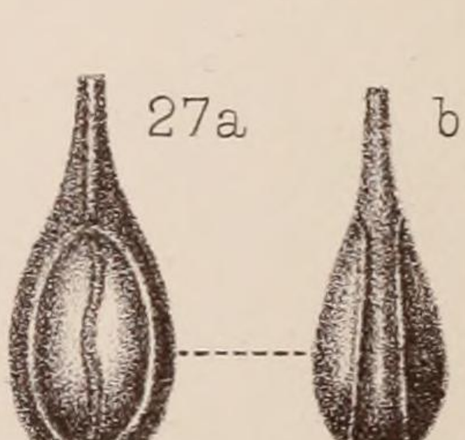








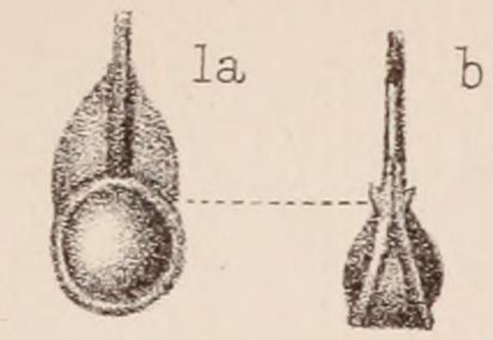


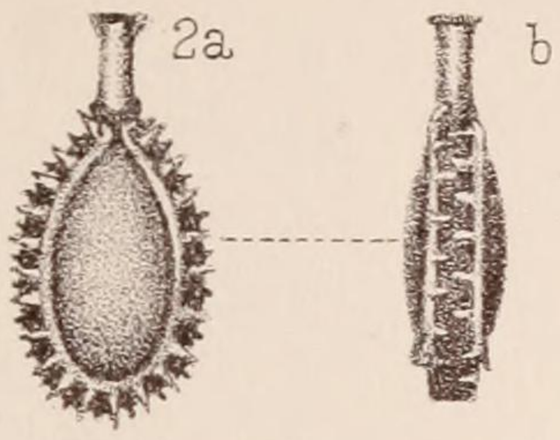


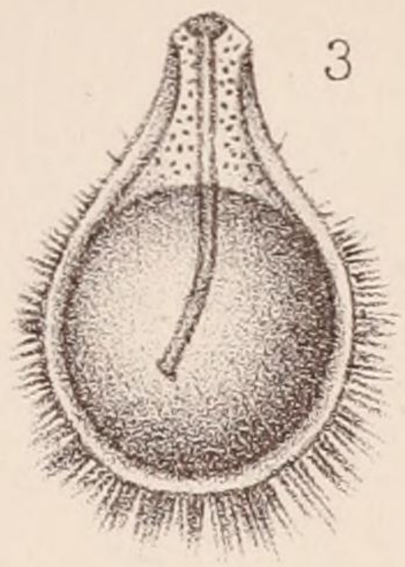
H. Sidebottom del. ad nat.

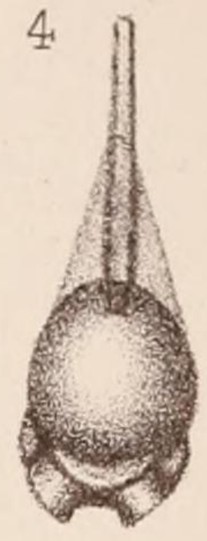
West, Newman lith.

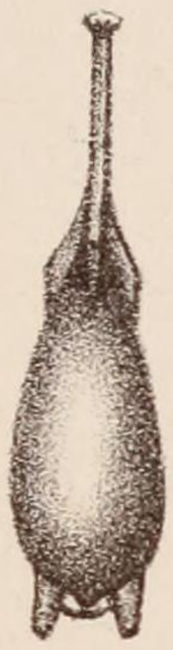
Lagenae of the South West Pacific Ocean.

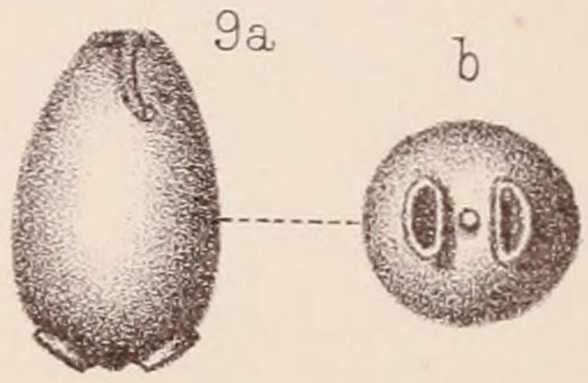


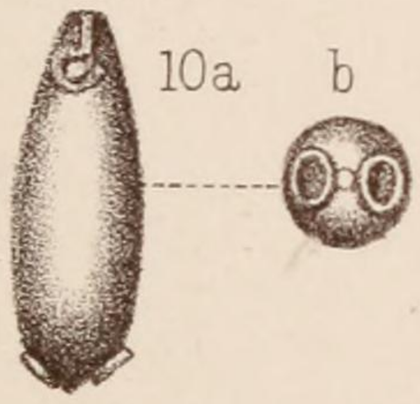


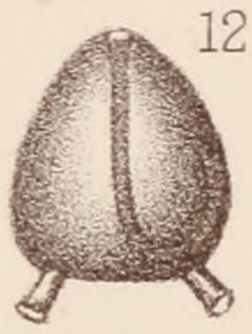


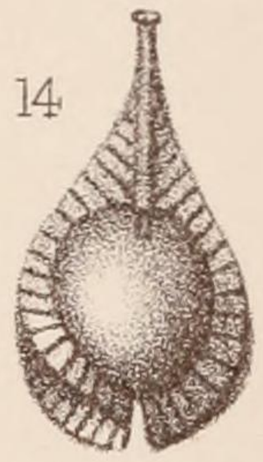


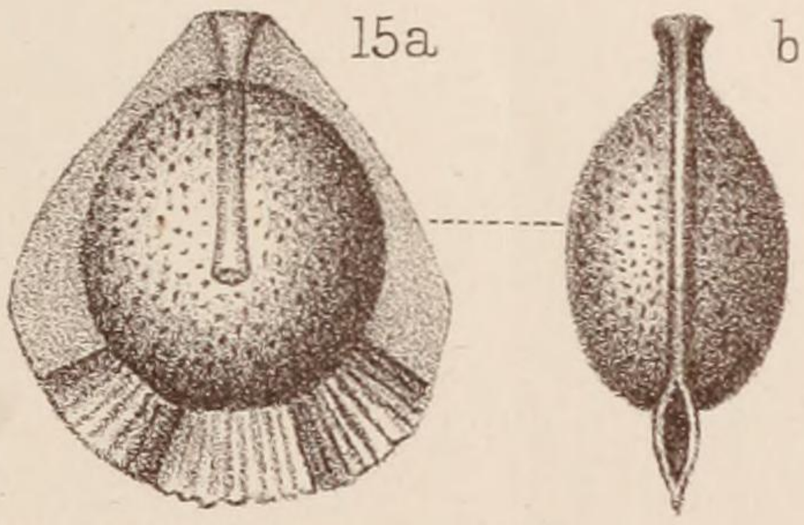


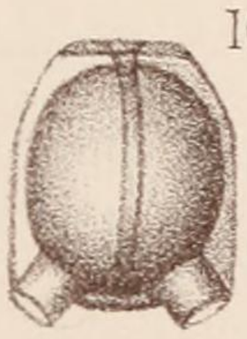


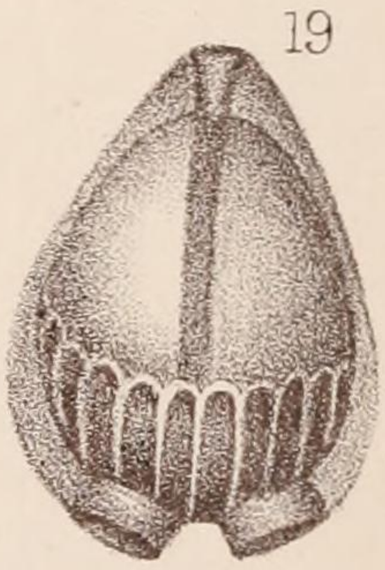


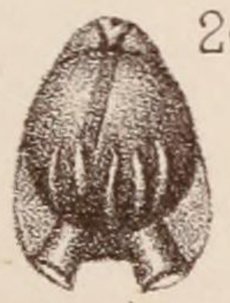


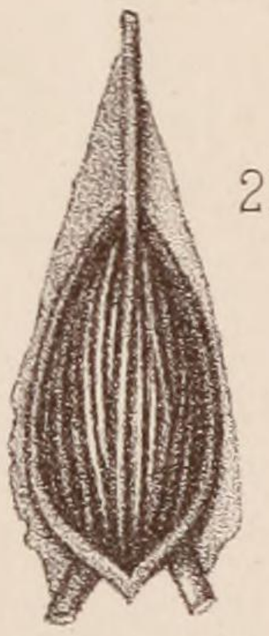


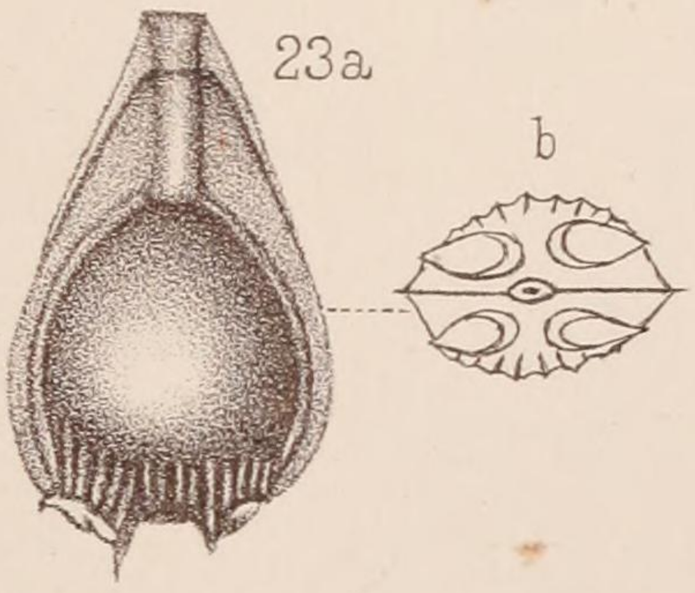


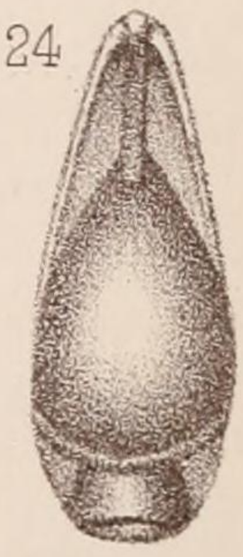


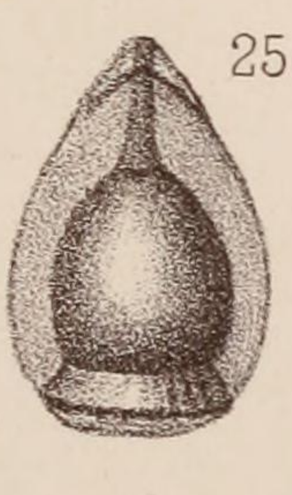


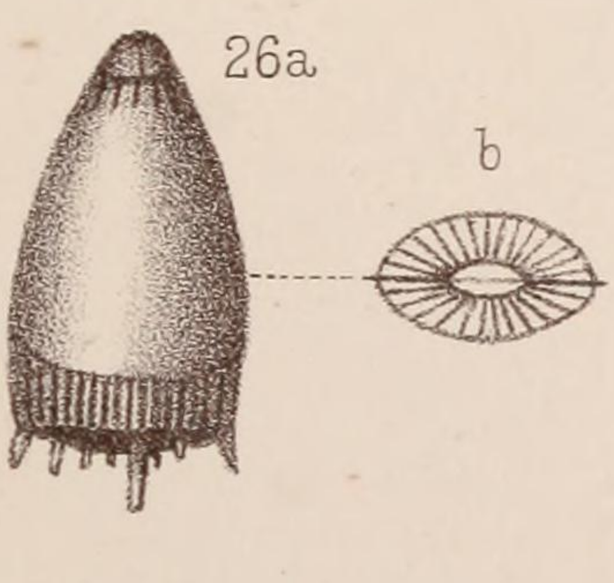


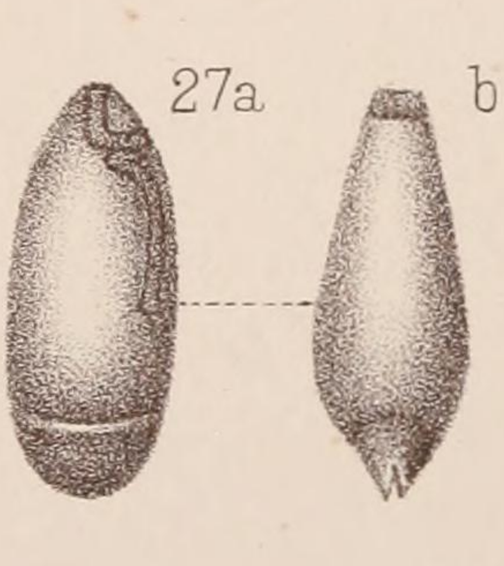


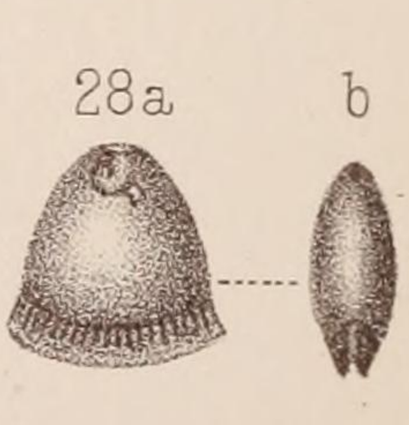






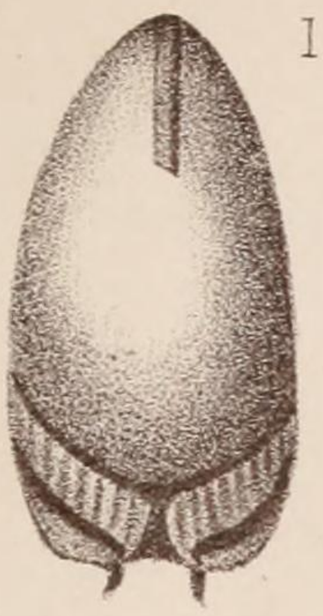


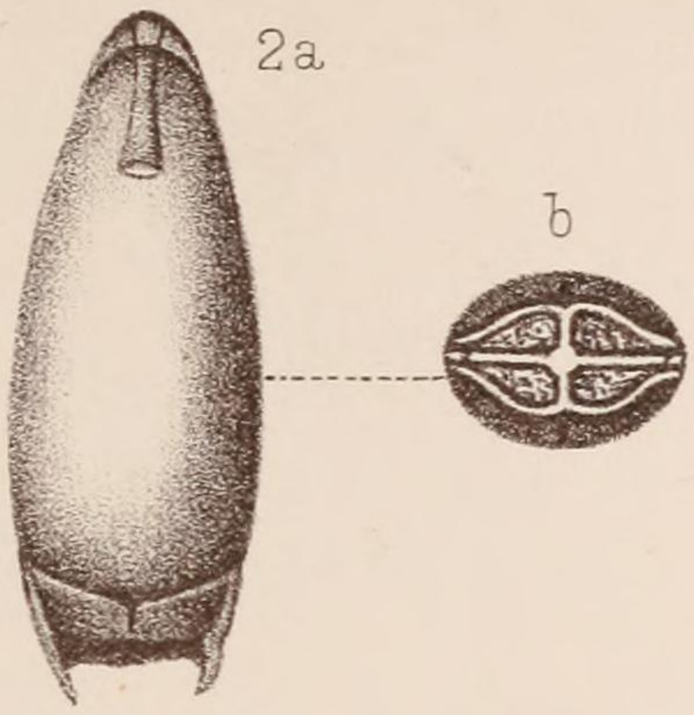


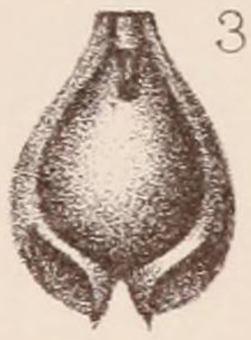


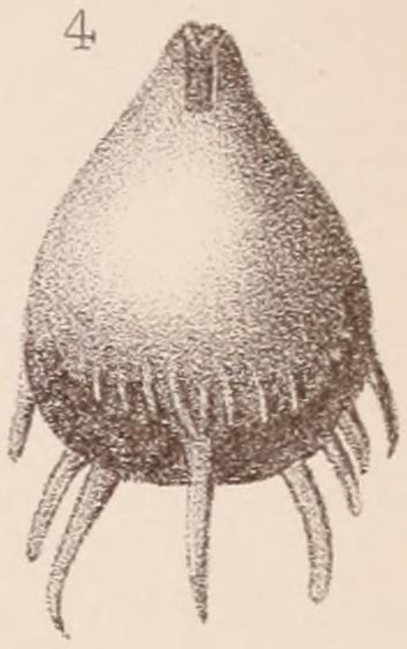
H. Sidebottom del. ad nat. West, Newman lith.

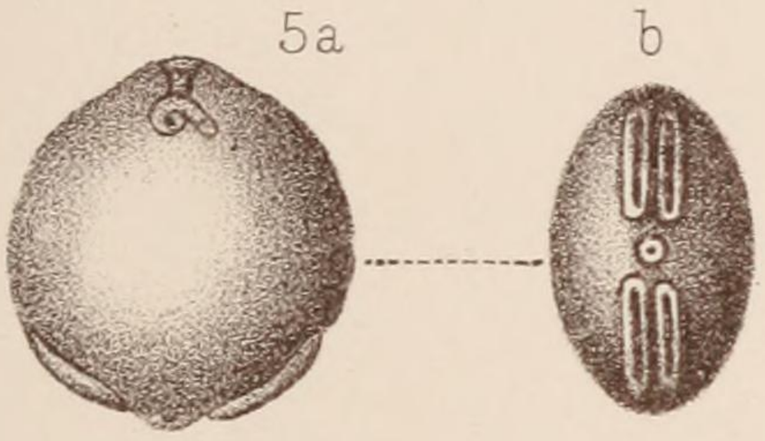
Lagenae of the South West Pacific Ocean.

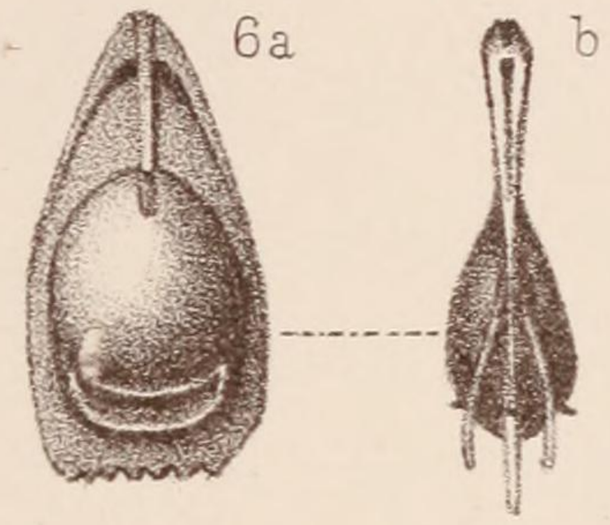


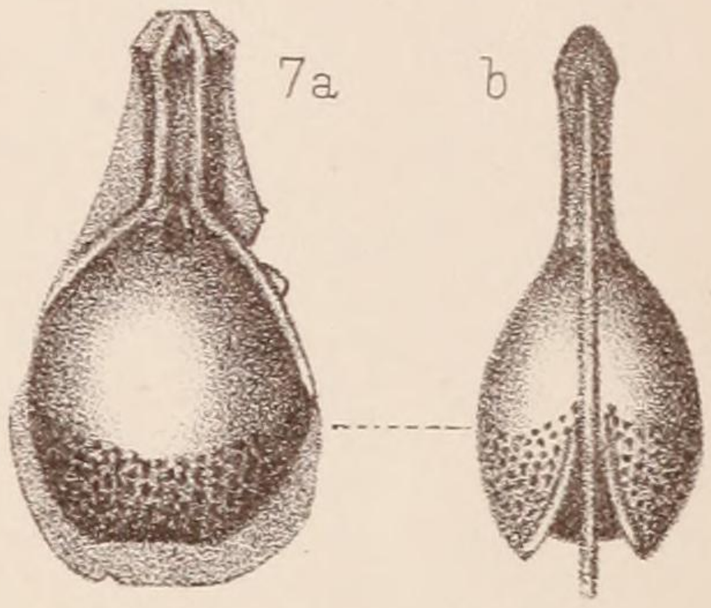


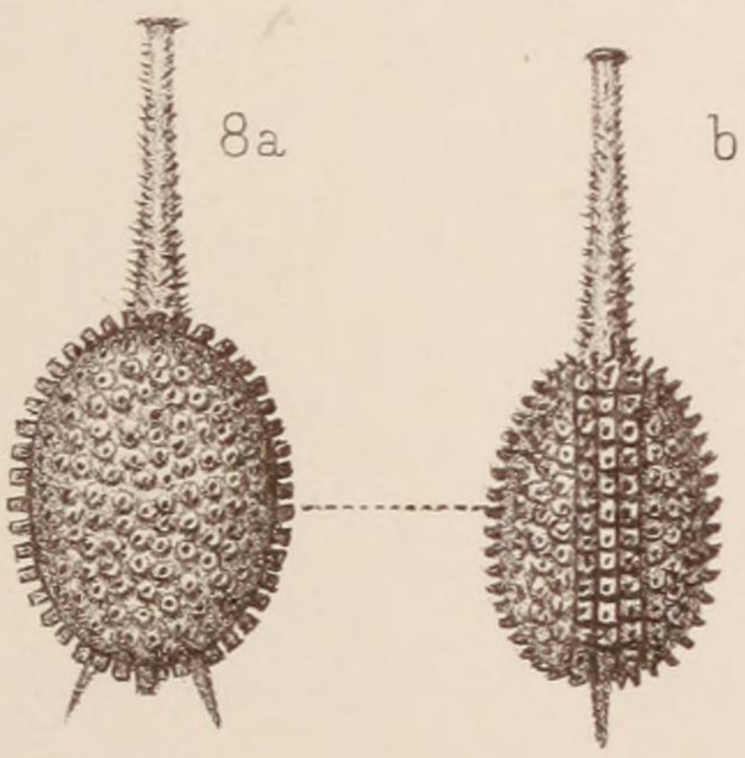


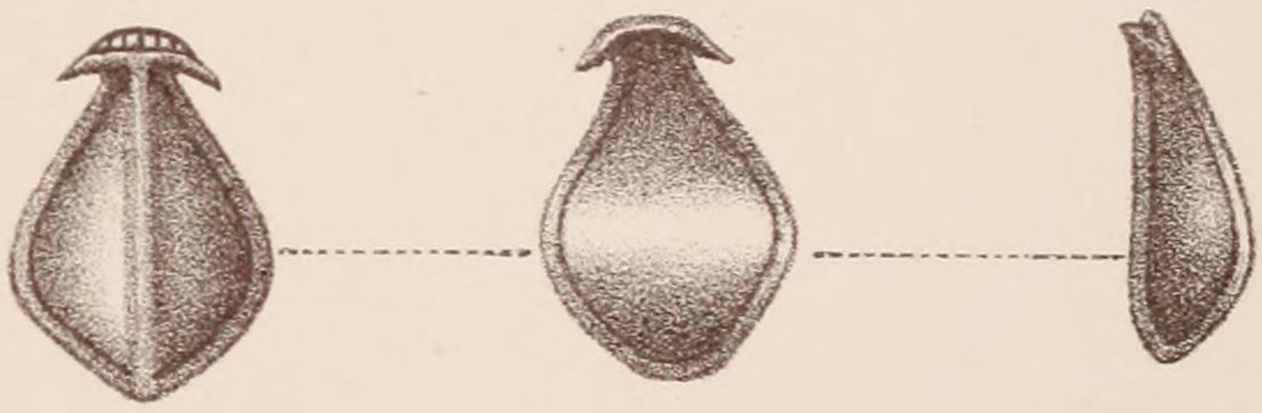


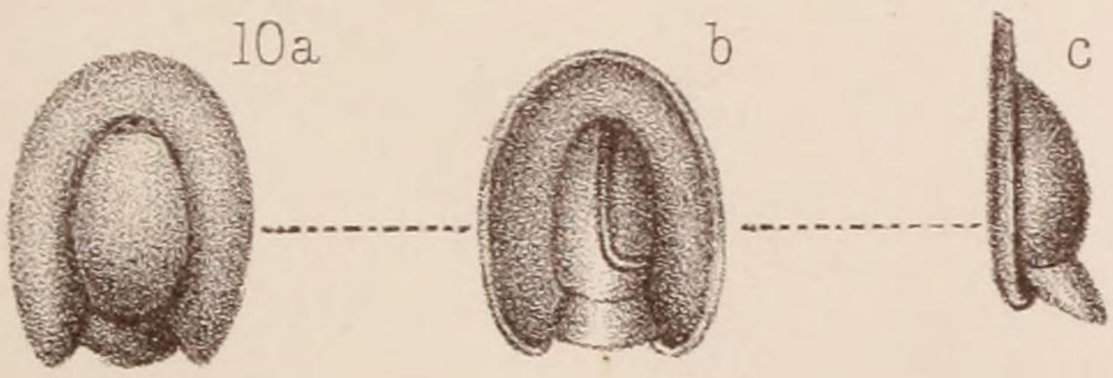


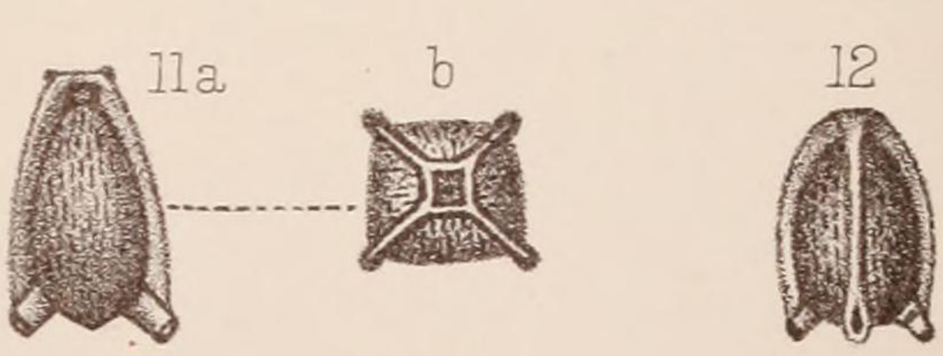


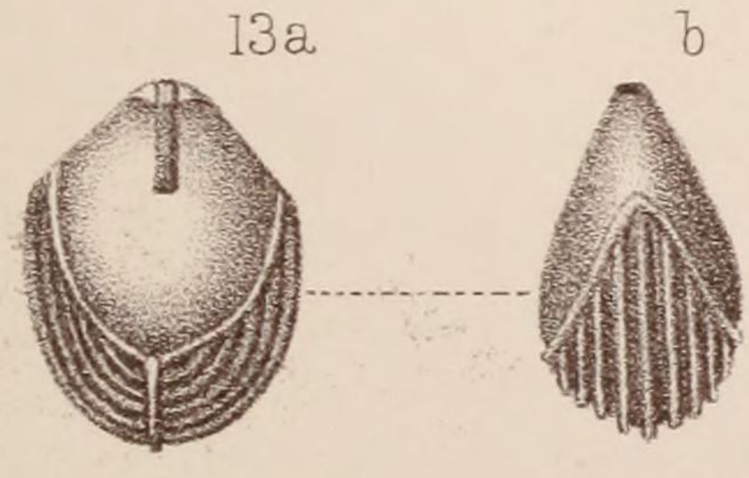


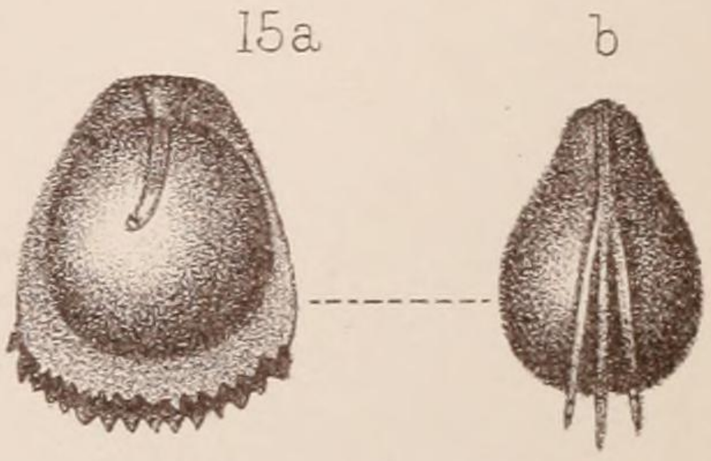


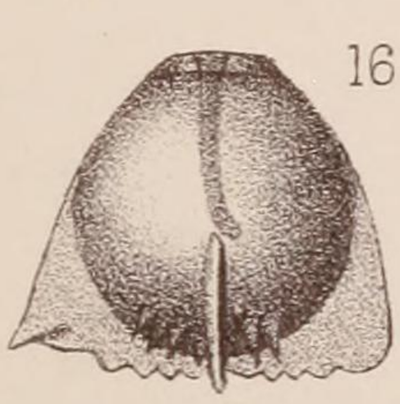


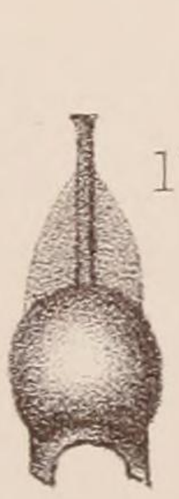












H. Sidebottom del. ad nat.

West, Newman lith.

Lagenae of the South West Pacific Ocean.