



F.W. Millett del. ad nat.

West, Newman lith.

FORAMINIFERA OF MALAY ARCHIPELAGO.

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TRANSACTIONS OF THE SOCIETY.

VIII.—*Report on the Recent Foraminifera of the Malay Archipelago collected by Mr. A. Durrand, F.R.M.S.—Part XI.*

By FORTESCUE WILLIAM MILLETT, F.R.M.S.

(Read 15th May, 1901.)

PLATE VIII.

Lagena crenata Parker and Jones, plate VIII. fig. 1.

L. crenata Parker and Jones, 1865, Phil. Trans., vol. clv. p. 420, pl. xviii. fig. 4. *L. crenata* (P. and J.) Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. p. 339, pl. xiv. figs. 17, 18.

This interesting, and, according to Brady, somewhat rare form, is abundant in the Malay Archipelago, and occurs at most of the Stations. Its relations with *L. semistriata* are well marked, and many of the passage-forms possess the characters of each species in

EXPLANATION OF PLATE VIII.

- Fig. 1.—*Lagena crenata* Parker and Jones. × 100. *a*, Lateral aspect; *b*, aboral aspect.
- „ 2, 3. „ *semistriata* Williamson. × 100.
- „ 4. „ *striata* var. *tortilis* Egger. × 90. *a*, Lateral aspect; *b*, oral aspect.
- „ 5. „ *curvilineata* Balkwill and Wright. × 135.
- „ 6. „ *striatopunctata* Parker and Jones. × 100.
- „ 7. „ „ var. *spiralis* Brady. × 150. *a*, Lateral aspect; *b*, oral aspect.
- „ 8. „ *plumigera* Brady. × 100. *a*, Lateral aspect; *b*, oral aspect.
- „ 9. „ *clavata* d'Orbigny var. *setigera* var. n. × 90. *a*, Lateral aspect; *b*, aboral aspect.
- „ 10. „ *elongata* Ehrenberg sp. × 75.
- „ 11. „ *quinquelatera* Brady. × 100. *a*, Lateral aspect; *b*, oral aspect.
- „ 12-14. „ *gracilis* Williamson. × 100.
- „ 15. „ *botelliformis* Brady. × 100. [Fig. 16.

about equal proportions. Although the coiled neck cannot in any way be regarded as a specific distinction, it may be remarked that the typical *L. crenata* always possesses this feature, and that it becomes less marked the nearer the individuals approach *L. semistriata*.

Of passage-forms towards *L. semistriata* may be enumerated the following:—

Lagenulina semistriata (Will.) Terquem, 1876, Anim. Plage de Dunkerque, Part 2, p. 68, pl. vii. fig. 8. *Lagena florida* Terquem, 1882, Mém. Soc. Géol. France, ser. 3. vol. ii. p. 26, pl. ix. fig. 9. *Oolina striaticollis* d'Orbigny, 1843, Foram. Amér. Mérid., p. 21, pl. v. fig. 14. *Lagena semistriata* (Will.) Brady, 1884, Chall. Rept., p. 465, pl. lvii. figs. 16, 17, 20. *L. semistriata* (Will.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 327, pl. x. fig. 39.

Lagena semistriata Williamson, plate VIII. figs. 2, 3.

Lagena striata var. β *semistriata* Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 14, pl. i. figs. 9, 10. *L. semistriata* (Will.) Wright, 1886, Proc. Belfast Nat. Field Club, 1884–85, App. ix. p. 324, pl. xxvi. fig. 6, and *L. semilineata*, p. 320, pl. xxvi. fig. 7. *L. semiornata* Terquem, 1886, Bull. Soc. Zool. France, vol. xi. p. 320, pl. xi. fig. 2. *L. semistriata* (Will.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 327, pl. x. fig. 34. *L. semistriata* (Will.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 76, pl. xiii. fig. 737. *L. semistriata* (Will.) Morton, 1897, Proc. Portland Nat. Hist. Soc., vol. ii. p. 117, pl. i. fig. 3.

This form is very well represented, and most of the figured varieties occur.

There is nothing particularly wonderful in the variations of beings existing under different circumstances half-a-world apart, or geological systems distant in point of time. These might be expected; but more interesting, because less accountable, are the variations of creatures living generation after generation side by side in the same locality, under the same conditions, and subject to precisely the same

EXPLANATION OF PLATE VIII.—*continued*.

- Fig. 16.—*Lagena lævigata* Reuss sp. var. *acuta* Reuss. $\times 100$. *a*, Lateral aspect; *b*, oral aspect.
 „ 17. „ *multicosta* Karrer sp. $\times 100$. *a*, Lateral aspect; *b*, peripheral aspect; *c*, oral aspect.
 „ 18. „ *quadrata* Williamson sp. var. $\times 100$. *a*, Lateral aspect; *b*, oral aspect.
 „ 19. „ *fasciata* Egger sp. $\times 100$. *a*, Lateral aspect; *b*, oral aspect.
 „ 20. „ *marginata* Walker and Boys var. $\times 100$. *a*, Lateral aspect; *b*, oral aspect.
 „ 21. „ *marginata* Walker and Boys var. $\times 100$. *a*, Lateral aspect; *b*, peripheral aspect.

external influences. In these varieties Mr. Durrand's gatherings are very rich, and it has been deemed more interesting to figure some of these, rather than to give a hackneyed illustration of the typical form.

Fig. 2 with the flat base is closely allied to *L. crenata*, whilst fig. 3 is flask-shaped and apiculate, with the delicate striæ characteristic of *L. striata*. This form has been figured by Reuss under the name of *L. strumosa*,* by Joseph Wright as *L. semilineata*, and by Terquem as *L. semiornata*.

Lagena striata d'Orbigny, sp.

Oolina striata d'Orbigny, 1843, Foram. Amér. Mérid, p. 21, pl. v. fig. 12. *Lagena substriata* Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 15, pl. i. fig. 12. *L. striata* (d'Orb.) Reuss, 1862, Sitzber. k. Akad. Wiss. Wien, vol. xlvi. p. 327, pl. iii. fig. 44, and pl. iv. figs. 46, 47. *L. striata* (d'Orb.) Brady, Parker, and Jones, 1888, Trans. Zool. Soc., vol. xii. p. 222, pl. xlv. fig. 28. *L. striata* (d'Orb.) Fornasini, 1893, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. iii. p. 431, pl. ii. fig. 2. *L. striata* (d'Orb.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 327, pl. x. figs. 21–23. *L. striata* (d'Orb.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 75, pl. xiii. figs. 732–736. *L. striata* (d'Orb.) Jones, 1895, Palæont. Soc., p. 184, pl. vii. fig. 8.

This species is well represented, being found in considerable abundance at nearly all the Stations.

Besides the typical oval form, specimens are frequent in which the body is elongate and cylindrical, as in *Phialina cylindracea* Seguenza,† or club-shaped as in *L. grinzingensis* Karrer.‡ Others are apiculate; whilst many have the striæ produced at the aboral end, forming a brush of projecting spines. The striæ are sometimes continuous, in other examples interrupted or branching, and are of various degrees of fineness, passing insensibly into *L. sulcata*.

Lagena striata d'Orbigny sp. var. *tortilis* Egger, plate VIII. fig. 4.

Lagena tortilis Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 329, pl. x. figs. 61–63.

This pretty little variety, as represented by the Malay Archipelago specimens, is a form of *L. striata* in which the striæ are arranged spirally in place of longitudinally. It bears the same relation to *L. striata* as *L. spiralis* bears to *L. striatopunctata*.

It is abundant at Station 25 and occurs sparingly at a few other Stations in both Areas. There is little or no variation in the speci-

* Sitzber. k. Akad. Wiss. Wien, vol. xlvi. 1862, p. 328, pl. iv. fig. 49.

† Foram. monotal. Mioc. Messina, 1862, p. 47, pl. i. fig. 24.

‡ Abhandl. k.k. Geol. Reichsanstalt, vol. ix. 1877, p. 378, pl. xvi. b, fig. 17.

mens. On the body the direction of the spiral is always that of a left-handed screw, whilst on the neck it takes the opposite direction. In the solitary 'Gazelle' specimen figured by Dr. Egger the spiral on the body of the shell is represented as being right-handed.

The tendency of *L. striata* to have its striae arranged obliquely has long been noticed, but hitherto no one has considered it necessary to give the variety a distinctive name. In this matter there is no general rule laid down, each author being guided by his own judgment. It would probably be wiser not to create new names for these trifling variations, but where the names exist there cannot be any great harm in making use of them.

The 'Gazelle' Station is West Australia.

Lagena curvilineata Balkwill and Wright, plate VIII. fig. 5.

Lagena curvilineata Balkwill and Millett, 1884, Journ. Micr., vol. iii. p. 27, pl. ii. fig. 3. *L. curvilineata* Balkwill and Wright, 1894, Trans. R. Irish Acad., vol. xxviii. p. 328, pl. xiv. figs. 21-24. *L. curvilineata* (B. and W.) Halkyard, 1889, Trans. and Ann. Rept. Manchester Micr. Soc., p. 67, pl. ii. fig. 3.

There is here figured a rather unsatisfactory example of a not very satisfactory species. It is from Station 14 in Area 1, and is a solitary specimen.

Lagena sulcata Walker and Jacob sp.

Serpula (*Lagena*) *striata sulcata rotundata* Walker and Boys, 1784, Test. Min., p. 2, pl. i. fig. 6. *Lagena striata* Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 13, pl. i. figs. 6, 8. *L. sulcata* (W. and J.) Parker and Jones, 1865, Phil. Trans., vol. clv. p. 351, pl. xiii. figs. 28, 29. *L. striata* (d'Orb.) Sherborn and Chapman, 1886, Journ. R. Micr. Soc., p. 745, pl. xiv. figs. 16, 17; and *L. sulcata* (W. and J.) p. 745, pl. xiv. fig. 18. *L. sulcata* (W. and J.) Brady, 1888, Geol. Mag., dec. 3, vol. v. p. 481, pl. xiii. fig. 11. *L. sulcata* (W. and J.) Brady, Parker, and Jones, 1888, Trans. Zool. Soc., vol. xii. p. 222, pl. xlv. fig. 22. *L. sulcata* (Walker and Boys) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 78, pl. xiii. fig. 744. *L. sulcata* (W. and J.) Jones, 1895, Palæont. Soc., p. 186, pl. i. figs. 40, 41 (1866). *L. sulcata* (W. and J.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 307, pl. liii. fig. 7. *L. sulcata* var. *Kiær*, 1899, Norske Nordhaus Exp. (Zool.) vol. xxv. p. 5, pl. i. fig. 10. *L. sulcata* (W. and J.) Wright, 1900, Geol. Mag., dec. 4, vol. vii. p. 100, pl. v. fig. 14.

Lagena sulcata var. *interrupta* Williamson.

Lagena striata var. *interrupta* Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 14, pl. i. fig. 7. *L. sulcata* (W.

and J.) Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. p. 338, pl. xiv. figs. 1, 2. *L. sulcata* (W. and J.) Haeusler, 1890, Abhandl. schweiz. Pal. Gesell., vol. xvii. p. 87, pl. xiii. fig. 27. *L. (sulcata) interrupta* (Will.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 328, pl. x. fig. 32.

The remarks made on *L. striata* apply equally to this form. The variety *interrupta* is less abundant and less widely distributed.

Lagena striatopunctata Parker and Jones, plate VIII. fig. 6.

Lagena sulcata var. *striatopunctata* Parker and Jones, 1865, Phil. Trans., vol. clv. p. 350, pl. xiii. figs. 25-27. *L. striatopunctata* (P. and J.) Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. p. 339, pl. xiv. fig. 20. *L. striatopunctata* (P. and J.) Chapman, 1893, Journ. R. Micr. Soc., p. 584, pl. viii. fig. 15. *L. striatopunctata* (P. and J.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 327, pl. x. figs. 35, 36, 44-46. *L. striatopunctata* (P. and J.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 83, pl. xiii. fig. 753.

This form, which elsewhere is somewhat rare, in the Malay Archipelago is very abundant at some Stations in Area 2, especially at No. 30; it is also found sparingly in Area 1.

The great majority of the specimens are of the cylindrical variety figured by Dr. Egger. In this form the ribs are broader than in the flask-shaped variety, and are flattened or even hollowed on the upper face. There is a rare variety in which the perforated alternate with solid ribs, as in the specimens of *L. desmophora* from the 'Challenger' Expedition figured by Brady.* Both the cylindrical and the flask-shaped forms are subject to an obliquity of the ribs, which connects them with *L. spiralis*. Frequently the neck is inclined to one side, as shown in the figured specimen.

The sole 'Gazelle' Station is Mauritius.

Lagena striatopunctata var. *spiralis* Brady, plate VIII. fig. 7.

Lagena spiralis Brady, 1884, Chall. Rept., p. 468, pl. cxiv. fig. 9. *L. spiralis* (Brady) Chaster, 1892, First Rept. of the Southport Soc. of Nat. Sci., 1890-1891 (1892) p. 60, pl. i. fig. 8.

The first notice of this beautiful little form appears to be that of Parker and Jones in 1865, when, in treating of *L. striatopunctata*, † they write "The ribs are comparatively strong; they range in number from four to twelve, and in one recent specimen we have seen them spiral." In 1871 it was figured by M. Ponton, ‡ but was not described by him. Brady's diagnosis of the species was made from an imperfect

* Chall. Rept., 1884, p. 468, pl. lviii. fig. 42.

† Phil. Trans., clv. (1865) p. 350.

‡ 'The Beginning,' 1871, p. 562, pl. A, fig. 4.

specimen procured from 'Challenger' Station 185, Raine Island, Torres Strait, 155 fathoms.

The shell, when perfect, has an elongated neck, with a rim at the oral end. The neck is quite smooth, and where it joins on to the body there is usually a conical mass of opaque shelly matter; these features are not shown in the hitherto published drawings of the variety. In some examples the punctation of the ribs is obscure, but none of them have been observed in which it is entirely wanting, as in the specimen described by Dr. Chaster.

In the Malay Archipelago and the 'Challenger' specimens the direction of the spiral is invariably that of a right-handed screw, directly opposite to that of the spiral variety of *L. striata*; but in the figures given by Ponton and Dr. Chaster the spiral is left-handed.

In the Malay Archipelago the species is very abundant, and its distribution is precisely the same as that of *L. striatopunctata*. In addition to 'Challenger' Station 185, I have a specimen from Station 172, off Nukualofa, Tongatabu, Friendly Islands, depth 18 fathoms. Dr. Chaster's examples are from mud under Southport Pier.

Lagena plumigera Brady, plate VIII. fig. 8.

Lagena plumigera Brady, 1881, Quart Journ. Micr. Sci., n.s., vol. xxi. p. 62. *L. plumigera* Brady, 1884, Chall. Rept., p. 465, pl. lviii. figs. 25, 27. *L. plumigera* (Brady) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 329, pl. x. figs. 37, 38.

This is essentially a deep-water species, and according to Brady has been obtained from the tropical regions of the South Pacific at depths of 2350 and 2425 fathoms, and from near the Cape de Verde islands at a depth of 1070 fathoms. Dr. Egger records it from New Guinea 455 fathoms, and from West Australia 645 fathoms.

In the Malay Archipelago it is extremely rare, and has been found only at Station 30, in Area 2.

This species seems to have its isomorph in the compressed *L. lagenoides*, from which it differs only in having the transverse section circular and in possessing a greater number of ribs.

Group of *Lagena clavata*.

Lagena clavata d'Orbigny sp.

Oolina clavata d'Orbigny, 1846, For. Foss. Vienne, p. 24, pl. i. fig. 2. *Lagena lævis* var. *amphora* Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 12, pl. i. figs. 3, 4. *L. lævis* (Mont.) Haeusler, 1887, Neues Jahrb. für Min., p. 181, pl. iv. figs. 39-48. *L. clavata* (d'Orb.) Brady, 1888, Geol. Mag., dec. 3, vol. v. p. 482, pl. xiii. figs. 4, 5. *L. lævis* (Mont.) Haeusler, 1890, Abhandl. schweiz. Pal. Gesell., vol. xvii. p. 86, pl. xiii. figs. 17, 18. *L. (Oolina) clavata* (d'Orb.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II.

vol. xviii. p. 324, pl. x. fig. 68. *L. clavata* (d'Orb.) Haeusler, 1893, Abhandl. schweiz. Pal. Gesell., vol. xx. p. 14, pl. i. figs. 17-22. *L. clavata* (d'Orb.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 75, pl. xiii. figs. 725-727. *L. clavata* (d'Orb.) Jones, 1895, Palæont. Soc., p. 182, pl. vii. fig. 5. *L. clavata* (d'Orb.) Morton, 1897, Proc. Portland Soc. Nat. Hist., vol. ii. p. 116, pl. i. fig. 2. *L. clavata* (d'Orb.) Fornasini, 1898, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. vii. p. 206, pl. 18. *L. clavata* (d'Orb.) Wright, 1900, Geol. Mag., dec. 4, vol. vii. p. 100, pl. v. fig. 13.

There is little to be said about this common species. In the Malay Archipelago it is nowhere abundant, but is scattered all over the region.

Lagena clavata d'Orbigny sp. var. *setigera* var. n., plate VIII. fig. 9.

Lagena lævis Montagu sp. (var.) Brady, 1884, Chall. Rept., pl. lvi. fig. 30.

Differs from the type in having at the aboral end a cup-shaped indentation surrounded by a circle of setæ.

In *Oolina striaticollis* d'Orbigny, and some of the figures of *Lagena tenuis* Bornemann, as interpreted by Reuss, the free ends of the ribs extend beyond the base of the shell and have a similar appearance; but in the variety under consideration the ribs are entirely wanting. Still the form is interesting, and worthy of notice as forming a connecting link between the smooth and the striated *Lagenæ*.

In the Malay Archipelago it is widely distributed, and is far more abundant than the type.

Lagena gracillima Seguenza sp.

Amphorina gracilis Costa, 1856, Atti Accad. Pontiniana, vol. vii. p. 121, pl. xi. fig. 11. *Amphorina gracillima* Seguenza, 1862, Foraminotal. Mioc. Messina, p. 51, pl. i. fig. 37. *Lagena gracillima* (Seg.) Brady, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. vi. p. 292, pl. xi. fig. 6. *L. gracillima* (Seg.) Chapman, 1893, Journ. R. Micr. Soc., p. 582, pl. viii. fig. 6. *L. gracillima* (Seg.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 330, pl. x. fig. 11. *L. gracillima* (Seg.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 75, pl. xiii. fig. 729. *L. gracillima* (Seg.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 306, pl. liii. fig. 3. *L. gracillima* (Seg.) A. Silvestri, 1900, Mem. Pontif. Accad. Nuovi Lincei, vol. xvii. p. 245, pl. vi. fig. 42.

This form is very well represented in both Areas, and the specimens form an unbroken chain from *L. clavata* to the distomatous *L. elongata*.

Lagena elongata Ehrenberg sp., plate VIII. fig. 10.

Miliola elongata Ehrenberg, 1854, Mikrogeologie, pl. xxv. i. A, fig. 1. *Lagena gracillima* (Seg.) Fornasini, 1883, Boll. Soc. Geol. Ital., vol. ii. p. 185, pl. ii. fig. 5. *L. elongata* (Ehr.) Tate and Blake, 1876, Yorkshire Lias, p. 454, pl. xviii. fig. 9. *L. elongata* (Ehr.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 330, pl. x. fig. 14. *L. elongata* (Ehr.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 75, pl. xiii. fig. 731; and *L. gracillima* (Seg.) p. 75, pl. xiii. figs. 728, 730. *L. elongata* (Ehr.) Fornasini, 1895, *Lagena elongata* Ehr. sp.? p. two figures in text. *L. elongata* (Ehr.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 306, pl. liii. fig. 1.

This cylindrical variety of *L. gracillima* is abundant, and occurs at many of the Stations in both Areas. The striated form (*L. distoma*) is not represented.

Lagena botelliformis Brady, plate VIII. fig. 15.

Lagena botelliformis Brady, 1881, Quart. Journ. Micr. Sci., n.s., vol. xxi. p. 60. *L. botelliformis* Brady, 1884, Chall. Rept., p. 454, pl. lvi. fig. 6. *L. botelliformis* (Brady) Chaster, 1892, First Rept. of the Southport Soc. of Nat. Sci., 1890-1891 (1892), p. 60, pl. i. fig. 11.

It is difficult to make out the affinities of this peculiar form; it may be an elongated and curved *L. globosa*; but on the whole it seems more nearly allied to *L. elongata*, with which consequently it is here associated.

In the Malay Archipelago it is very rare, and has been found only at Station 5 in Area 1, and Station 25 in Area 2.

The 'Challenger' specimens were obtained from shallow water off the Cape de Verde Islands; in material from mid-ocean in the South Atlantic, 2350 fathoms; and from Station 302, south of Juan Fernandez, 1450 fathoms. Dr. Chaster obtained it from mud under Southport Pier.

Lagena gracilis Williamson, plate VIII. figs. 12-14.

Lagena gracilis Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 13, pl. i. fig. 5. *L. williamsoni* var. near *striatopunctata* Balkwill and Millett, 1884, Journ. Micr., vol. iii. p. 78, pl. iv. fig. 4. *L. gracilis* (Will.) Chapman, 1893, Journ. R. Micr. Soc., p. 583, pl. viii. fig. 13. *L. gracilis* (Will.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 328, pl. x. figs. 25, 49; and *L. sulcata* (P. and J.), p. 328, pl. x. fig. 73. *L. gracilis* (Will.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv.

p. 77, pl. xvii. fig. 738. *L. gracilis* (Will.) Jones, 1895, Palæont. Soc., p. 189, pl. vii. fig. 6.

This is usually a striated variety of *L. clavata*, but it assumes many forms, as well illustrated by Brady in the 'Challenger' Report. In the Malay Archipelago the majority of the specimens have an affinity with the apiculata form of *L. striata* named by Seguenza *Amphorina Lyellii*,* and passage-forms exist in an unbroken series from the one to the other.

The examples figured show variations in the form of the test as well as in the character of the sculpture, which ranges from that of *L. striata* to that of *L. sulcata*.

It is abundant at Station 30, and occurs at a few other Stations in both Areas.

Lagena quinquelatera Brady, plate VIII. fig. 11.

Lagena quinquelatera Brady, 1881, Quart. Journ. Micr. Sci., n.s. vol. xxi. p. 60. *L. quinquelatera* Brady, 1884, Chall. Rept., p. 484, pl. lxi. figs. 15, 16. *L. quinquelatera* (Brady) var. *inflata* Chapman, 1893, Journ. R. Micr. Soc., p. 584, pl. vii. fig. 17.

This is a rare form in the Malay Archipelago, although it occurs at several Stations. The margins are subcarinate, and usually exhibit small cavities placed at regular intervals; some of the 'Challenger' specimens are faintly striate, and Chapman says of the gault variety "aboral extremity minutely denticulate."

Brady describes the species as being "compressed equally on five sides," and classes it with the compressed *Lagenæ*, although he also speaks of it as a modification of *L. lævis*.

The Malay Archipelago examples find their nearest affinities in *L. gracilis*, and might almost be described as a variety of that species.

The 'Challenger' localities are, South Pacific, north of the Society Islands, 2350 fathoms; and Southern Ocean, off Prince Edward's Island, 50-150 fathoms.

Compressed *Lagenæ*.

Group of *Lagena lævigata*.

Lagena lævigata Reuss sp.

Fissurina lævigata Reuss, 1850, Denkschr. k. Akad. Wiss. Wien, vol. i. p. 366, pl. xlvi. fig. 1. *Lagena lævigata* (Reuss) Balkwill and Millett, 1884, Journ. Micr., vol. iii. p. 80, pl. ii. fig. 6; and trigonal form p. 81, pl. iii. fig. 6. *L. marginata* (Montagu) Haeusler, 1887, Neues Jahrb. für Min., p. 186, pl. iv. figs. 51, 52.

* Foram. monotal. Mioc. Messina, 1862, p. 52, pl. i. fig. 40.

L. lucida (Will.) Fornasini, 1888, Boll. Soc. Geol. Ital., p. 47, pl. iii. fig. 5. *L. (Fissurina) lævigata* (Reuss) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 330, pl. x. figs. 64, 65. *L. marginata* (Montagu) Haeusler, 1893, Abhandl. schweiz. Pal. Gesell., vol. xx. p. 18, pl. i. figs. 65, 66. *L. lævigata* (Reuss) Jones, 1895, Palæont. Soc., p. 197, pl. vii. fig. 14. *L. lævigata* (Reuss) Madsen, 1895, Meddelelser fra Dansk Geol. Forening, No. 2, pp. 74 and 195, pl. fig. 3. *L. lævigata* (Reuss) var. *calostoma* Fornasini, 1901, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. ix. p. 48, fig. 2 A B.

This widely distributed form is found in more or less abundance at nearly all of the Malay Archipelago Stations. It varies in the usual manner from globular to elongate, and is of various degrees of compression, but in all cases the margin is marked by a narrow band of clear shell-substance.

Lagena lævigata Reuss sp. var. *acuta* Reuss sp.,
plate VIII. fig. 16.

Entosolenia marginata var. *lucida* Williamson, 1858, Rec. Foram. Gt. Britain, p. 10, pl. i. fig. 23. *Fissurina acuta* Reuss, 1862, Sitzber. k. Akad. Wiss. Wien, vol. xlvi. p. 340, pl. vii. fig. 90, and *F. apiculata*, p. 339, pl. vi. fig. 85. *Lagena acuta* (Reuss) Fornasini, 1888, Boll. Soc. Geol. Ital., vol. vii. p. 47, pl. iii. fig. 6. *L. acuta* (Reuss) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 332, pl. x. figs. 74, 75. *L. acuta* (Reuss) var. *sacculus* Fornasini, 1901, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. ix. p. 49, pl. fig. 3.

This occurs in two forms. In one of these, as in *L. lævigata*, the margin is rounded and marked by a band of clear shell-substance. The other is the variety described by Brady in the 'Challenger' Report,* and stated by him to be "not quite typical, and might with equal propriety be treated as a mucronate example of *Lagena marginata*."

In the Malay Archipelago the variety more nearly corresponding with *L. lævigata* is the more common and more generally distributed; the carinate variety is more restricted in its range, and is found most abundantly in Area 2.

Lagena lucida Williamson sp.

Entosolenia marginata var. *lucida* Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 17, pl. ii. fig. 17. *Lagena lucida* (Will.) Balkwill and Millett, 1884, Journ. Micr., vol. iii. p. 80, pl. ii. fig. 7, and pl. iii. figs. 4, 5.

* Chall. Rept., 1884, p. 474, pl. lix. fig. 6.

In this variety the clear shell-substance surrounding the aperture, besides forming the marginal band as in *L. lævigata*, is produced on the centre of each side into an oval or pear-shaped mass. Compared with *L. lævigata* the test is usually broader at the base and more angular, tapering towards the oral end. Many of the examples are, however, elongate, and some apiculate.

This form is by no means so common nor so widely distributed as *L. lævigata*, and has received but little notice from writers on the Foraminifera. It is very abundant in the Tertiary beds of St. Erth, and the difference in the shell-structure is there as well marked as in the recent specimens.

Lagena fasciata Egger sp. plate VIII. fig. 19.

Oolina fasciata Egger, 1857, Neues Jahrb. für Min., p. 270, pl. v. figs. 12–15. *Lagena fasciata* (Egger) Reuss, 1862, Sitzber. K. Akad. Wiss. Wien, vol. xlvi. p. 323, pl. ii. fig. 24. *Fissurina* Nos. 66 and 67 von Schlicht, 1870, Foram. Septar. Pietzpuhl, p. 12, pl. iv. figs. 25–30. *L. quadricostulata* Reuss, 1870, Sitzber. K. Akad. Wiss. Wien, vol. lxii. p. 469. *L. quadricostulata* (Reuss) Brady, 1884, Chall. Rept., p. 486, pl. lix. fig. 15.

Having traced the changes of form in the disposition of the clear and the opaque shell-substance in *L. lævigata* and *L. lucida*, it is now necessary to follow them through their further stages. Taking *L. annectens* Burrows and Holland,* two narrow curved bands appear on each side of the shell. In *L. faba* Balkwill and Millett these bands are slightly raised, whilst they become costæ in *L. quadricostulata* Reuss, *L. fasciata* Egger, and *L. Meyeriana* Chapman. †

These bands may or may not unite at the base of the shell; Dr. Egger's examples of *L. fasciata* show both conditions, whilst in the only known specimen of *L. Meyeriana* the costæ, although continuous, are recurved, and form a sinus at the aboral extremity.

In the Malay Archipelago *L. fasciata* is abundant and widely dispersed, and there is great variety not only in the form of the test, but in the strength and disposition of the costæ.

It is a common form in the Tertiary beds of St. Erth.

Lagena multicosta Karrer sp., plate VIII. fig. 17.

Fissurina multicosta Karrer, 1877, Abhandl. K. K. Geol. Reichsanstalt, vol. ix. p. 379, pl. xvi. b fig. 20, and *Fissurina Bouei* p. 378, pl. xvi. b fig. 19. *Lagena multicosta* (Karrer) Brady, 1884, Chall. Rept., p. 466, pl. lxi. fig. 4. *Lingulina costata* (d'Orb.) Fornasini, 1889, Mioc. di San Rufillo, pl. i. fig. 17.

* Palæont. Soc., 1895, p. 203, pl. vii. fig. 11.

† Journ. Micr., vol. iii. 1884, p. 81, pl. ii. fig. 10.

‡ Quart. Journ. Geol. Soc., vol. i. 1894, p. 706, pl. xxxiv. fig. 7.

This is another member of the group possessing the two different characters of shell-substance; and, as in *L. lævigata*, the clear shell-substance surrounding the aperture extends in a thin band round what may be called the margin of the test.

In the Malay Archipelago examples there is very little branching or other irregularity of the costæ, and they usually cover the entire surface of the test from the base to the prominence in which is situated the aperture.

The form is extremely abundant at several stations in Area 2, but is very rare in Area 1.

The only 'Challenger' station reported is No. 346, South Atlantic, a little south of the Equator, 2350 fathoms, but I have found it in the material from Station 185, Raine Island, Torres Strait, 155 fathoms.

Lagena quadrata Williamson sp., plate VIII. fig. 18.

Entosolenia marginata var. *quadrata* Williamson, 1858, Rec. Foram. Gt. Britain, p. 11, pl. i. fig. 27. *Lagena lucida* var. *quadrata* (Will.) Reuss, 1862, Sitzber. K. Akad. Wiss. Wien, vol. xlvi. p. 324, pl. ii. fig. 26. *L. quadrata* (Will.) Balkwill and Millett, 1884, Journ. Micr., vol. iii. p. 81, pl. ii. fig. 8. *L. lævigata* var. *quadrata* (Will.) Wright, 1886, Proc. Belfast Nat. Field Club, 1884-5, App. ix. p. 324, pl. xxvi. fig. 9. *L. quadrata* (Will.) Egger, 1893, Abhandl. K. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 331, pl. x. figs. 78, 79; and *L. compressa*, p. 331, pl. x. figs. 1, 2. *L. quadrata* (Will.) var. Jones, 1895, Palæont. Soc., p. 198, pl. vii. fig. 9.

Here, as elsewhere, this species occurs in two forms; one of them with the margin rounded, and allied to *L. lævigata*; the other with a carinate margin, and differing but little from *L. marginata*.

It occurs at several Stations in the Malay Archipelago, but only in small numbers.

Group of *Lagena marginata*.

Lagena marginata Walker and Boys.

"Serpula (*Lagena*) *marginata*" Walker and Boys, 1784, Test. Min., p. 2, pl. i. fig. 7. *Lagena marginata* (W. and B.) Brown, 1827, Illustr. Conch. Gt. Brit., fly-leaf, pl. i. figs. 30, 31. *L. marginata* (W. and J.) Balkwill and Millett, 1884, Journ. Micr., vol. iii. p. 81, pl. iii. fig. 2. *L. marginata* (Montagu) Haeusler, 1887, Neues Jahrb. für Min., vol. i. p. 186, pl. iv. fig. 53. *L. marginata* (W. and B.) Brady, Parker, and Jones, 1888, Trans. Zool. Soc., vol. xii. p. 222, pl. xlv. figs. 27, 29, 30, 32. *Fissurina alata* (Reuss) Franzénau, 1889, Math. termész. értesito, vol. vii. p. 249, pl. iii. fig. 4. *L. marginata* (Montagu) Haeusler, 1890, Abhandl. schweizer. Pal. Gesell., vol. xvii. p. 86, pl. xiii. fig. 112. *L. marginata* (W. and B.),

Chapman, 1893, Journ. R. Micr. Soc., p. 584, pl. viii. fig. 16. *L. marginata* (W. and B.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 332, pl. x. figs. 20, 66, 67, 96, 97. *L. marginata* (W. and B.) Goës, 1894, K. Svenska Vet. Akad. Handl., vol. xxv. p. 81, pl. xiii. fig. 748. *L. marginata* (W. and J.) Jones, 1895, Palæont. Soc., p. 199, fig. 22. *L. marginata* (W. and B.) Silvestri, 1896, Mem. Pontif. Accad. Nuovi Lincei, vol. xii. p. 119, pl. iii. figs. 7-9. *L. marginata* (W. and B.) Perner, 1897, Česká Akad. Císare Frantiska Josefa (Palæont. Bohemica) No. 4, p. 18, pl. vii. figs. 3, 5, 7. *L. marginata* (Walker) Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xxi. p. 104, pl. v. fig. 5. *L. marginata* (W. and B.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897, (1899) p. 307, pl. liv. fig. 2. *L. marginata* (W. and B.) Silvestri, 1900, Mem. Pontif. Accad. Nuovi Lincei, vol. xvii. p. 243, pl. vi. figs. 51, 52. *L. marginata* (W. and B.) Fornasini, 1900, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. viii. p. 376, fig. 25. *L. marginata* (W. and B.) Wright, 1900, Geol. Mag., dec. 4, vol. vii. p. 100, pl. v. fig. 17.

This usually common form is not very abundant in the Malay Archipelago, and although it is plentiful at a few Stations, at the others it occurs but sparingly.

It is best represented by its varieties, which are numerous and diversified.

Lagena marginata Walker and Boys var. plate VIII. fig. 20.

This variety is distinguished by its truncated contour, the test being almost semicircular, with the aperture situated in a depression at the apex of the shell. In form it closely resembles the *Fissurina aperta* of Seguenza* and the *Lagena faba* of Balkwill and Millett.†

It is very rare, and occurs only at a few Stations.

Lagena marginata Walker and Boys var. plate VIII. fig. 21.

This variety is also very rare. The recurved spines at the oral extremity of the elongated neck appear to have but little value as a criterion of species, as they have been found by F. W. O. Rymer Jones in *L. lævis*,‡ and by Dr. Chaster in a compressed form resembling *L. lævigata*.§

* Foram. monotal. Mioc. Messina, 1862, p. 60, pl. i. fig. 60.

† Journ. Micr., vol. iii. 1884, p. 81, pl. ii. fig. 10.

‡ *Lagena vulgaris* typica, Trans. Linn. Soc., vol. xxx. 1872, p. 51, pl. xix. fig. 13.

§ *Lagena falcata*, First Rept. of the Southport Soc. of Nat. Sci., 1892, p. 6, pl. i. fig. 7.

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AND

A SUMMARY OF CURRENT RESEARCHES RELATING TO
ZOOLOGY AND BOTANY

(principally Invertebrata and Cryptogamia)

MICROSCOPY, &c.

EDITED BY

A. W. BENNETT, M.A. B.Sc. F.L.S.

Lecturer on Botany at St. Thomas's Hospital

WITH THE ASSISTANCE OF THE PUBLICATION COMMITTEE AND

R. G. HEBB, M.A. M.D. F.R.C.P.

*Lecturer on Forensic Medicine at
Westminster Hospital*

J. ARTHUR THOMSON, M.A. F.R.S.E.

*Regius Professor of Natural History in
the University of Aberdeen*

A. N. DISNEY, M.A. B.Sc.

MARION NEWBIGIN, D.Sc.

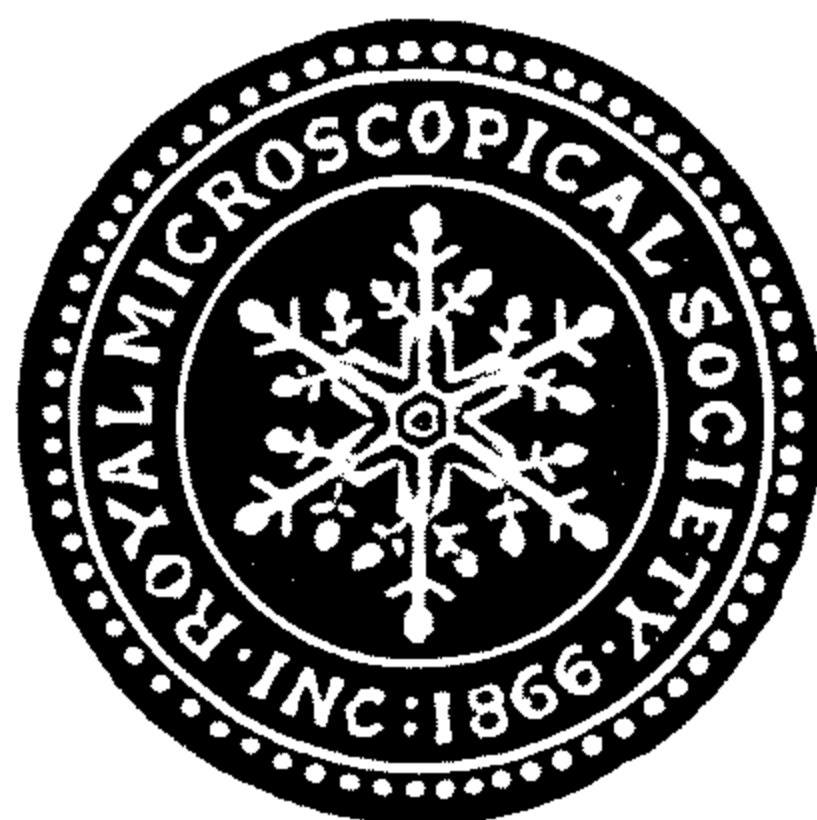
*Lecturer on Zoology, Edinburgh College of
Medicine for Women*

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