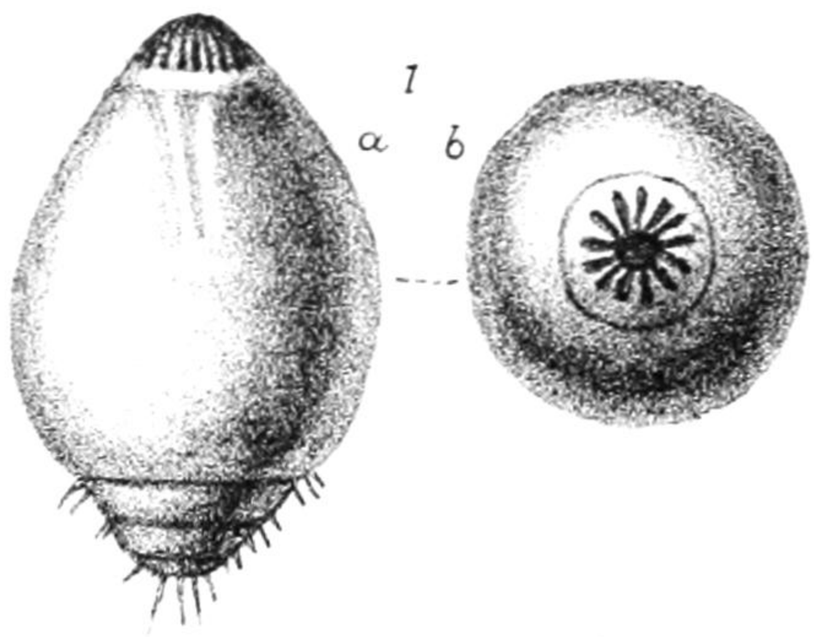

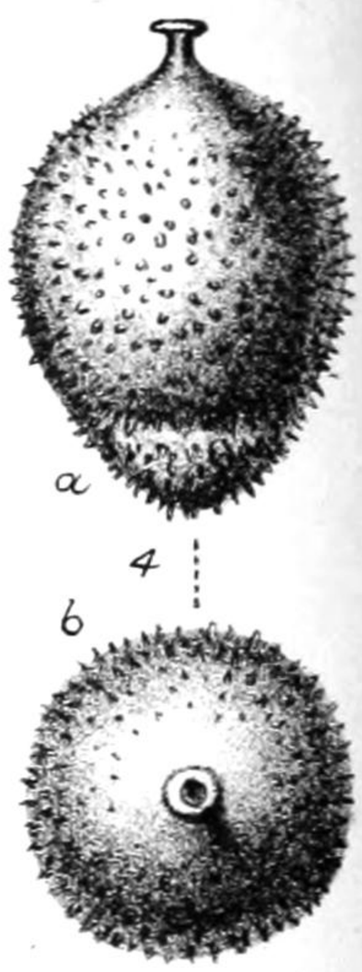

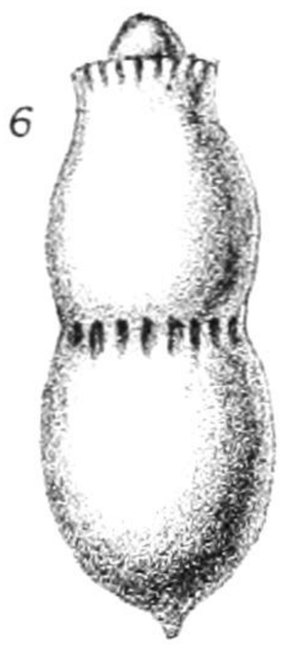

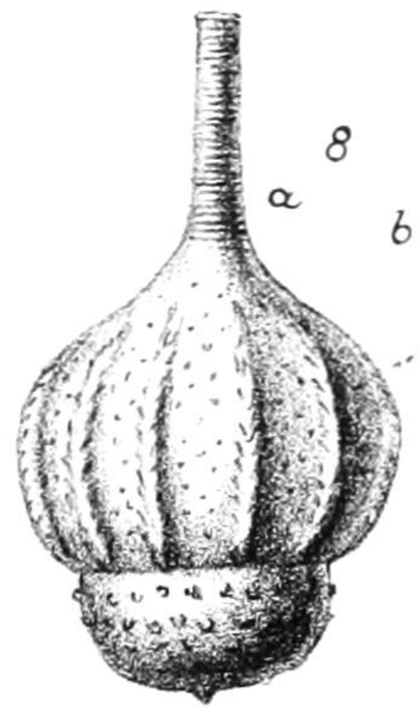

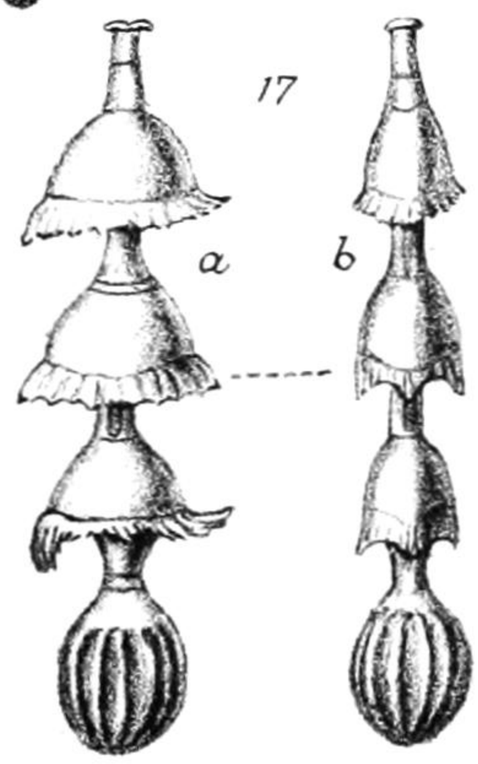

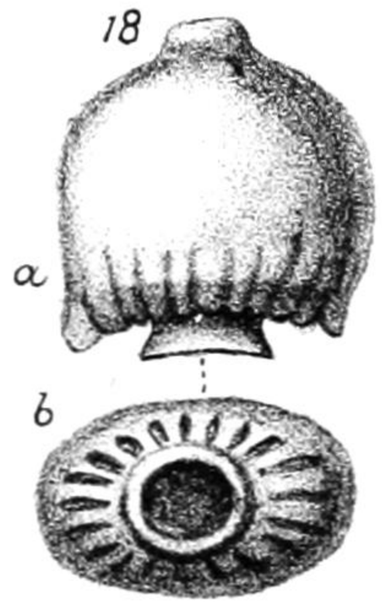

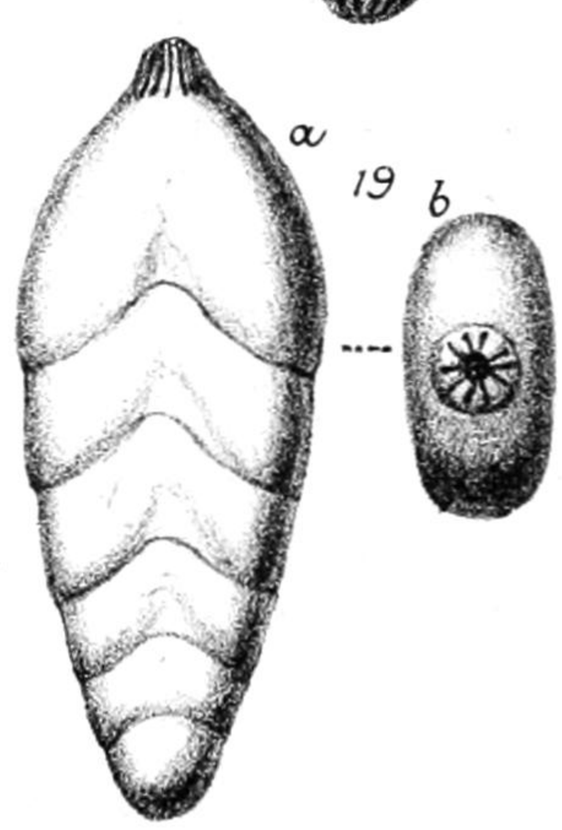

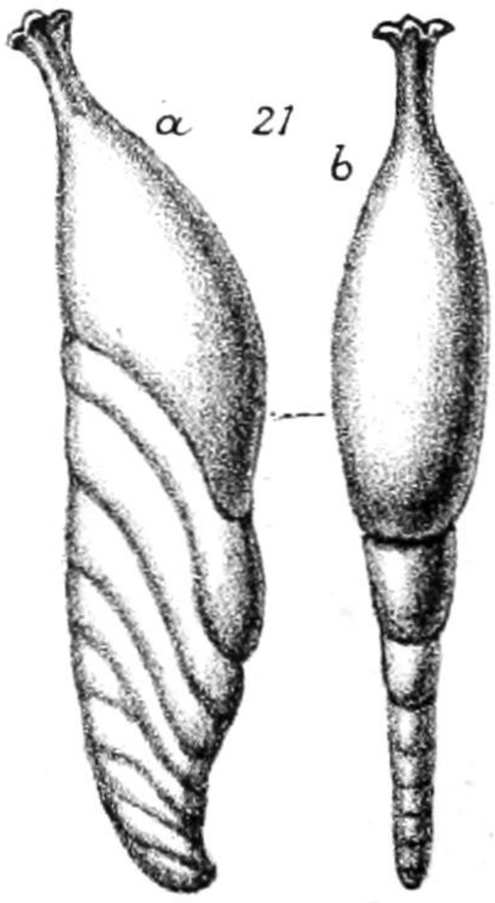

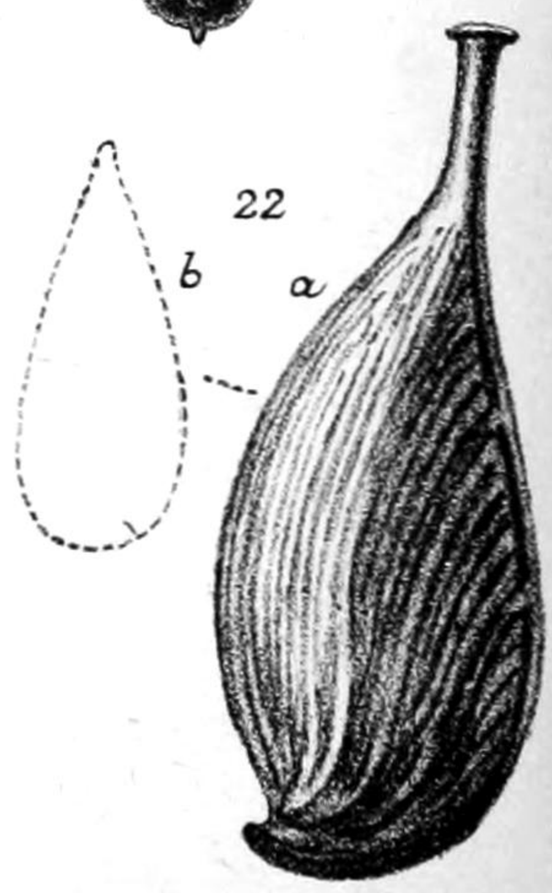

F.W. Millett del. ad. nat.

Hanhart lith & imp.

Foraminifera of Malay Archipelago.

JOURNAL

OF THE

ROYAL MICROSCOPICAL SOCIETY.

OCTOBER 1902.

TRANSACTIONS OF THE SOCIETY.

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

By Fortescue William Millett, F.R.M.S.

(*Read March 19th*, 1902.)

Plate XI.

Sub-Family **Nodosarinæ.**

Nodosaria Lamarck.

Nodosaria (*Glandulina*) *lævigata* d'Orbigny, plate XI. fig. 1.

"Cornu Hammonis erectum globosius," Plancus, 1739, Conch. Min., p. 16, pl. ii. fig. 3. *Nodosaria* (*Glandulina*) *lævigata* d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 252, pl. x. figs. 1–3. *Glan-*

EXPLANATION OF PLATE XI.

Fig. 1.—*Nodosaria* (*Gl.*) *lævigata* d'Orbigny. × 90. *a*, lateral aspect; *b*, oral aspect.
„ 2. „ „ *comata* Batsch sp. × 90.
„ 3. „ „ *æqualis* Reuss. × 90.
„ 4. „ „ *echinata* sp. n. × 65. *a*, lateral aspect; *b*, oral aspect.
„ 5.—*Nodosaria semirugosa* d'Orbigny. × 60.
„ 6. „ *capitata* Boll. × 65.
„ 7. „ *limbata* d'Orbigny. × 90.
„ 8. „ *bicamerata* F. W. O. R. Jones sp. × 90. *a*, lateral aspect *b*, aboral aspect.
„ 9. „ *proxima* O. Silvestri. × 90.
„ 10. „ *scalaris* Batsch sp. var. × 75.
„ 11, 12. „ „ „ var. *separans* Brady. × 60.
„ 13, 14. „ (?) *obscura* Reuss. Fig. 13 × 65; fig. 14 × 90.
„ 15.—*Lingulina limbata* sp. n. × 100.
„ 16, 17. „ *pagoda* sp. n. × 75. *a*, lateral aspect; *b*, peripheral aspect.
„ 18 „ sp. indet. × 100. *a*, lateral aspect; *b*, aboral aspect.
„ 19.—*Frondicularia nitida* Terquem. × 80.
„ 20.—*Marginulina costata* Batsch sp. × 60.
„ 21.—*Vaginulina legumen* Linné sp. var. × 75. *a*, lateral aspect; *b*, peripheral aspect.
„ 22. „ *formosa* sp. n. × 90. *a*, lateral aspect; *b*, horizontal section.

dulina lævigata var. *inflata* (Born.) Andreae, 1884, Abhandl. geol. Special Karte Elsass-Loth., vol. ii. p. 206, pl. vii. fig. 12; and var. *elliptica* (Reuss), p. 206, pl. x. fig. 22. *G. lævigata* (d'Orb.) Gumbel, 1885, Geol. Bayern, p. 422, fig. 266, 4. *Nodosaria* (*Glandulina*) *abbreviata* (Neug.) Sherborn and Chapman, 1886, Journ. R. Micr. Soc., p. 746, pl. xiv. fig. 20. *G. lævigata* Haeusler, 1887, Neues Jahrb. für Min., p. 189, pl. v. fig. 29. *Nodosaria* (*Gland.*) *lævigata* (d'Orb.) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 556, pl. ix. figs. 14, 15. *G. lævigata* (d'Orb.) Haeusler, 1890, Abhandl. schweiz. Pal. Gesell., vol. xvii. p. 91, pl. xiii. figs. 61–63; and pl. xiv. fig. 2. *G. lævigata* (d'Orb.) Crick and Sherborn, 1891, Journ. Northamp. Nat. Hist. Soc., vol. vi. p. 209, pl. vi. fig. 4. *G. lævigata* (d'Orb.) Beissel (Holzapfel), 1891, Abhandl. k. Preuss. geol. Landesanst., N.F., Heft 3, p. 29, pl. vi. figs. 7–9. *G. lævigata* (d'Orb.) Hosius, 1892, Verhandl. Nat. Ver. Preuss. Rheinlands Westphal., Jahrg. xlix. p. 152, pl. ii. figs. 1, 2. *G. lævigata* (d'Orb.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. pp. 336 and 339, pl. xi. fig. 31. *Nodosaria lævigata* (d'Orb.) Dervieux, 1893, Boll. Soc. Geol. Italia, vol. xii. p. 597, pl. v. figs. 1, 2. *Nodosaria lævigata* (d'Orb.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 71, pl. xiii. figs. 702, 703, 706, 707, 709. *G. cuspidata* Franzenau, 1894, Glasnik Hrv. Nar. Družtva, p. 259, pl. v. fig. 5. *G. lævigata* (d'Orb.) Jones, 1895, Palæont. Soc., p. 207. *G. lævigata* var. *chilostoma* Rzehak, 1895, Ann. k. k. Naturh. Hofmuseums, vol. x. part 2, p. 219, pl. vii. fig. 6. *Nodosaria lævigata* (d'Orb.) Silvestri, 1896, Mem. Pontif. Acad. Nuovi Lincei, vol. xii. p. 122, pl. iii. fig. 11 (anomalous). *Nodosaria lævigata* (d'Orb.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 308, pl. lv. fig. 3. *G. lævigata* (d'Orb.) Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xxi. p. 81, pl. v. fig. 31. *G. lævigata* (d'Orb.) Silvestri, 1900, Mem. Pontif. Acad. Nuovi Lincei, vol. xvii. p. 248, pl. vi. figs. 41, 49. Idem, 1900, Atti e Rendic. Acad. Sci. Lett. e Arti dei Zelanti e P.P. dello Studio di Acireale, vol. x. p. (1) pl. figs. 1–5, 9, 16. *G. lævigata* (d'Orb.) var. *subornata* Fornasini, 1901, Mem. R. Acad. Sci. Ist. Bologna, ser. 5, vol. ix. p. 56, fig. 9.

This form is very abundant and exhibits the usual variations, the chambers sometimes being almost entirely exposed; at other times nearly concealed by the embracing latest chamber. The sutures are of various degrees of obliquity, and the aperture is frequently entosolenian.

It is found at most of the Stations in both Areas, and is very evenly distributed.

Nodosaria (*Glandulina*) *rotundata* Reuss.

Glandulina rotundata Reuss, 1849, Denkschr. K. Akad. Wiss. Wien, vol. i. p. 366, pl. xlvi. fig. 2. *Nodosaria* (*Gl.*) *obtusissima* (Reuss) Sherborn and Chapman, 1886, Journ. R. Micr. Soc., ser. 2,

vol. vi. p. 746, pl. xiv. fig. 21. *Nodosaria* (*Gl.*) *obtusissima* (Reuss) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 556, pl. ix. fig. 16. *G. rotundata* (Reuss) Fornasini, 1896, Rivista Ital. di Paleont., fig. 1. *Nodosaria rotundata* (Reuss) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 308, pl. liv. fig. 6. *G. lævigata* A (d'Orb.) (*rotundata*) Silvestri, 1899, 1900, Atti e Rendic. Accad. Sci. Lett. e Arti dei Zelanti e P.P. dello Studio di Acireale, vol. x. pl. figs. 7, 8, 10–15.

This variety with the rounded base is almost as abundant as the foregoing, and is just as evenly distributed. The aperture likewise is often entosolenian, but there is not quite so much variation in the form of the test.

In treating of the fauna of an extensive region it is hardly desirable to enter into the controversy with regard to the dual forms, and it must be left to other investigators to determine if *G. lævigata* and *G. rotundata* are respectively the microspheric and megalospheric states of the same species, but it may be pointed out that their almost equal abundance in the Malay Archipelago is rather against the theory.

Nodosaria (*Glandulina*) *echinata* sp. n., plate XI. fig. 4.

Test subovate; broadest near the centre and tapering towards each end, the base being either acute or rounded. Sutures indistinct. Aperture situated in a short neck with an everted lip. Surface of the shell beset with minute spines which are longest at the primordial end of the test. Length 0·38 mm.

This may be described as a spinous variety of both *N. lævigata* and *N. rotundata*. In the present state of uncertainty as to the nature of the relations between the Nodosariæ differing in character only in having the base either acute or rounded, it is here considered inadvisable to follow the hitherto accepted rule of treating the two forms as representing different species, and giving them distinctive names, consequently the more simple course has been adopted of associating them under one heading.

Their intimate relationship is shown by their both possessing the phialine aperture, which is an unusual feature in *Glandulina*.

There are numerous examples of a variety of *N. lævigata*, in which the spines are confined to the base. This form has the aperture invariably mammillate with radiating striæ; and the base is always acute or apiculate.

The three spinous varieties here described are by no means uncommon in the Malay Archipelago, being found at several Stations in both Areas and are about equal in number.

Nodosaria (*Glandulina*) *æqualis* Reuss, plate XI. fig. 3.

Glandulina æqualis Reuss, 1863, Sitzungsber. k. Akad. Wiss Wien, vol. xlviii. p. 48, pl. iii. fig. 28. *G. æqualis* (Reuss) Forna-

sini, 1886, Boll. Soc. Geol. Italia, vol. v. p. 337, pl. vii. figs. 1–12. *Nodosaria candela* (Egger) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 556, pl. ix. fig. 18. *Nodosaria æqualis* (Reuss) Fornasini, 1894, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. iv. p. 202, pl. i. fig. 1. *Nodosaria æqualis* (Reuss) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 72, pl. xiii. figs. 704, 705, 708, 710, 711. *G. æqualis* (Reuss) Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xxi. p. 84, pl. v. fig. 22. *G. æqualis* (Reuss) Silvestri, 1900, Mem. Pontif. Accad. Nuovi Lincei, vol. xvii. p. 249, pl. vi. figs. 58, 59.

This cylindrical variety is rounded at the base typically, and in that condition may be regarded as an elongate form of *N. rotundata*. In the Malay Archipelago the examples are invariably acutely pointed at the primordial end, thus indicating an affinity with *N. lævigata*. For the reasons given in treating of *N. echinata* the two forms are again associated.

It is very rare in the Malay Archipelago, and occurs only in Area 1.

Nodosaria (*Glandulina*) *comata* Batsch sp., plate XI. fig. 2.

Nautilus (*Orthoceras*) *comatus* Batsch, 1791, Conch. Seesands, p. 2, pl. i. fig. 2 a–d. *Nodosaria* (*Glandulina*) *glans* d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 252, No. 2; and Modèle No. 51. *N.* (*Gland.*) *glans* (d'Orb.) Jones and Parker, 1860, Quart. Journ. Geol. Soc., vol. xvi. p. 453, pl. xix. fig. 7. ? *Glandulina glans* (d'Orb.) Fornasini, 1883, Boll. Soc. Geol. Italia, vol. ii. pl. ii. fig. 6. *Nodosaria comata* (Batsch sp.) Fornasini, 1891, Foram. Plioc. del Ponticello di Savena, pl. ii. fig. 18. *Nodosaria cornuta* (sic) (Batsch sp.) Grzybowski, 1895, Rozprawy Wydz. mat.-Przyr. Akad. Umiej-Krakowie, vol. xxx. p. 293, pl. x. fig. 8. *Nodosaria comata* (Batsch sp.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 311, pl. lvii. fig. 3. *Glandulina comata* (Batsch sp.) Fornasini, 1900, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. viii. p. 380, fig. 29.

This, in its more compact form, is nothing more nor less than a typical *Glandulina lævigata*, having its surface covered with delicate striæ, and has been well represented by d'Orbigny under the name of *Glandulina glans*. Amongst a multitude of specimens from the Malay Archipelago, passage, forms are to be found in abundance leading gradually and insensibly from this Glanduline to the elongated Nodosarian form, which may be considered to represent *Nodosaria radicula* with a striated surface.

In his 'Challenger' Report,* Brady has so thoroughly dealt

* Brady, Chall. Rept., 1884, p. 509.

with the subject and so well explained the affinity of the apparently dissimilar forms figured by Batsch, that to attempt to add anything to his statement would be a mere waste of time.

As a recent form, it has been recorded from only a very few Stations, but these are wide apart, extending from the West Indies to Mauritius, at depths not exceeding 450 fathoms.

In the Malay Archipelago, it occurs in great abundance all over the region.

Nodosaria radicula Linné sp.

Cornu Hammonis erectum" Plancus, 1739, Conch. Min., p. 14, pl. i. fig. 5, A, B, C. *Nautilus radicula* Linné, 1767, Syst. Nat., p. 1164. *Nodosaria radicula* (Linn.) Sherborn and Chapman, 1886, Journ. R. Micr. Soc., ser. 2, vol. vi. p. 746, pl. xiv. fig. 24. *N. radicula* (Linn.) Malagoli, 1887, Boll. Soc. Geol. Italia, vol. vi. p. 520, pl. xiii. fig. 4. *N. radicula* (L) Idem, 1887, Atti Soc. Nat. Modena, ser. 3, vol. iii. p. 109, pl. i. fig. 8. *N. radicula* Mariani, 1889, Boll. Soc. Geol. Italia, vol. vii. p. 286, pl. x. fig. 7. *N. radicula* (Linn.) Haeusler, 1890, Abhandl. schweiz. pal. Gesell., vol. xvii. p. 92, pl. xiii. figs. 41–45, 47, 48, 50, 53. *N. radicula* (Linn.) Crick and Sherborn, 1891, Journ. Northamp. Nat. Hist. Soc., vol. vi. pl. i. fig. 5. *N. radicula* (Linn.) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. p. 78, pl. ii. fig. 4. *N. radicula* (Linn.) Haeusler, 1893, Abhandl. schweiz. pal. Gesell., vol. xx. p. 23, pl. ii. figs. 36–46. *N. radicula* (Linn.) Grzybowski, 1897, Rozprawy Wydz. Przyr. Akad. Umiej-Krakowie, vol. xxxiii. p. 296, pl. xii. fig. 18. *N. radicula* (Linn.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 309, pl. lv. fig. 1. *N. radicula* (Linn.) Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. II., vol. xxi. p. 67, pl. v. fig. 40.

This is a widely distributed form, but Brady states that it has not been found in the North Pacific.

Nodosaria calomorpha Reuss.

Nodosaria calomorpha Reuss, 1865, Denkschr. k. Akad. Wiss. Wien, vol. xxv. p. 129, pl. i. figs. 15–19. *N. bistegia* Dunikowski, 1879, Kosmos (Lemberg) vol. iv. p. 106, pl., fig. 4. *N. calomorpha* (Reuss) Brady, Parker, and Jones, 1888, Trans. Zool. Soc., vol. xii. p. 223, pl. xliv. figs. 1, 4. *N. calomorpha* (Reuss) Haeusler, 1890, Abhandl. schweizer Pal. Gesell., vol. xvii. p. 95, pl. xiii. figs. 35–37. *N. calomorpha* (Reuss) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 566, pl. ix. fig. 21. *N. calomorpha* (Reuss) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. p. 78, pl. ii. fig. 5. *N. calomorpha* (Reuss) Chaster, 1892, First Rept. of the Southport Soc. of Nat. Sci., 1890–1891 (1892) p. 63, pl. i. fig. 12. *N. calomorpha* (Reuss) Haeusler, 1893, Abhandl. schweizer Pal. Gesell.,

vol. xx. p. 27, pl. i. fig. 73; pl. iii. fig. 47. *N. calomorpha* (Reuss) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 340, pl. xi. figs. 21, 26. *N. calomorpha* (Reuss) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 72, pl. xiii. figs. 712, 713. *N. calomorpha* (Reuss) Grzybowski, 1895, Rozprawy Wydz. mat.-Przyr. Akad. Umiej-Krakowie, vol. xxx. p. 293, pl. x. fig. 31. *N. calomorpha* (Reuss) Morton, 1897, Proc. Portland Soc. Nat. Hist., vol. ii. p. 118, pl. i. fig. 6.

This delicate little *Nodosaria*, with its thin transparent chambers resembling a string of bubbles, is common in the Malay Archipelago, and widely distributed in both Areas. Usually the test consists of two or three segments only, and these, from the formation of the last added chamber, appear to be complete in themselves, but there are examples which possess four and even five segments. Some of the two-chambered specimens differ from *N. simplex* Silvestri only in wanting the mucro at the base of the initial chamber. Goës suggests that *N. calomorpha* may be the megaspheric form of *N radicula* or *N. paupcrata.*

The area of distribution of the species is very wide; whilst bathymetrically its range according to Brady is from 6 fathoms to 2200 fathoms, and it is recorded by Dr. Egger from depths of 17 to 677 metres.

Nodosaria pyrula d'Orbigny.

Nodosaria pyrula d'Orbigny, 1826, Ann. Sci. Nat.. vol. vii. p. 253, No. 13. *Lagena lævis* (W. and J.) Clarke, 1849, Ann. and Mag. Nat. Hist., ser. 2, vol. iii. p. 382, fig. *Nodosaria pyrula* (d'Orb.) Williamson, 1858, Rec. Foram. Gt. Britain, p. 17, pl. ii. fig. 39. *N. pyrula* (d'Orb.) Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Sci.) p. 343, pl. xii. fig. 23. *N. pyrula* (d'Orb.) Brady, Parker, and Jones, 1888, Trans. Zool. Soc., vol. xii. p. 223, pl. xliv. fig. 2. *N. pyrula* (d'Orb.) Fornasini, 1890, Mem. R. Accad. Sci. Ist. Bologna, ser. 4, vol. x. p. 468, pl. fig. 11. *N. pyrula* (d'Orb.) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. part 1, p. 89, pl. ii. fig. 29. *N. pyrula* (d'Orb.) Haeusler, 1893, Abhandl. schweizer Pal. Gesell., vol. xx. p. 28, pl. v. figs. 25, 26. *N. pyrula* (d'Orb.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss. Cl. II. vol. xviii. p. 345, pl. xi. figs. 14, 15. *N. pyrula* (d'Orb.) Dervieux, 1893, Boll. Soc. Geol. Italia, vol. xii. fasc. 4, p. 603, pl. v. fig. 15. *N. pyrula* (d'Orb.) Silvestri, 1896, Mem. Pontif. Accad. Nuovi Lincei, vol. xii. p. 134, pl. iii. fig. 21. *N. pyrula* (d'Orb.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 309, pl. lv. fig. 4.

This fragile variety is represented by both the straight and the curved form *D. guttifera* d'Orbigny. At no Station is it abundant, but it occurs in both Areas.

Nodosaria hispida d'Orbigny.

"Orthoceratia quasi hispida" Soldani, 1798, Testaceographia, vol. ii. p. 15, pl. ii. fig. P. *Nodosaria hispida* d'Orbigny, 1846, For. Foss. Vienne, p. 35, pl. i. figs. 24, 25. *N. hispida* (d'Orb.) Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Sci.) p. 343, pl. xii. fig. 31. *N. hispida* (d'Orb.) Sherborn and Chapman, 1886, Journ. R. Micr. Soc., ser. 2, vol. vi. p. 748, pl. xiv. fig. 32. *N. hispida* (d'Orb.) Brady, Parker, and Jones, 1888, Trans. Zool. Soc., vol. xii. p. 223, pl. xliv. figs. 3, 5. *N. hispida* (d'Orb.) Mariani, 1889, Boll. Soc. Geol. Italia, vol. vii. p. 286, pl. x. fig. 6. *N. hispida* (d'Orb.) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. p. 81, pl. ii. fig. 13. *N. hispida* (d'Orb.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 343, pl. xi. fig. 16. *N. hispida* (d'Orb.) Chapman, 1893, Journ. R. Micr. Soc., p. 591, pl. ix. fig. 5. *N. hispida* (d'Orb.) Silvestri, 1893, Atti e Rendic. Accad. Sci. Lett. e Arti dei Zelanti e P.P. dello Studio di Acireale, vol. v. p. 13, pl. ii. figs. 8–11. *N. hispida* (d'Orb.) Fornasini, 1894, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. iv. p. 208, pl. i. figs. 16–18. *N. hispida* (d'Orb.) Rhumbler, 1895, Zool. Anzeiger, No. 474, fig. 6. *N. hispida* (d'Orb.) Perner, 1897, Česká Akad. Císaře Františka Josefa (Palæont. Bohemiæ No. 4) p. 24, pl. iii. fig. 31. *N. hispida* (d'Orb.) Fornasini, 1897–98, Rendic. R. Accad. Sci. Ist. Bologna, n.s. vol. ii. p. 4, pl. i. fig. 1. *N. hispida* (d'Orb.) Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xxi. p. 79, pl. ix. figs. 23, 24. *N. hispida* (d'Orb.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 311, pl. lvii. fig. 1. *N. hispida* (d'Orb.) Fornasini, 1901, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. ix. p. 53, fig. 6.

N. hispida in its typical form may be regarded as a variety of *N. pyrula* with its surface beset with spines. There is great diversity in the form as well as in the disposition of the chambers; usually these are connected by a long stoloniferous tube, but frequently this is wanting, and the test, composed of sessile chambers, differs only from *N. radicula* or *N. scalaris* in having the surface hispid. Sometimes both forms appear in one test, the later chambers only having the stoloniferous tubes.

It is found at several Stations in both Areas, but is by no means common, and the examples are small.

Nodosaria semirugosa d'Orbigny, plate XI. fig. 5.

Nodosaria semirugosa d'Orbigny, 1846, For. Foss. Vienne, p. 34, pl. i. figs. 20–23. *Nodosaria* No. 35, Von Schlicht, 1870, Foram. Septarienthones von Pietzpuhl, p. 24, pl. vii. fig. 20. *N. stipitata* var. *costulata* Reuss, 1870, Sitzungsber. k. Akad. Wiss. Wien, vol. lxii. Abth. i. p. 471. *N. costulata* (Reuss) Brady, 1884, Chall. Rept., p. 515, pl. lxiii. figs. 23–27. *N.* (*cf.*) *semirugosa* (d'Orb.)

Hosius, 1892, Verhandl. Nat. Ver. Preuss. Rheinl. Westphal., Jahrg. xlix. p. 156, pl. ii. fig. 5. *N. costellata* (Reuss) Perner, 1897, Česká Akad. Císaře Františka Josefa (Palæont. Bohemiæ No. 4) p. 29, pl. iii. fig. 18. *N. costulata* (Reuss) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 312, pl. lviii. fig. 1.

This variety of the *N. pyrula* group differs from the last described only in having the base of the chambers marked by short costæ. The remarks on the diversity of shapes in the hispid variety apply equally to the partially costate form, and in the Malay Archipelago the distribution is similar.

It is difficult to understand why Reuss should have failed to identify Von Schlicht's figure with d'Orbigny's *N. semirugosa*, and why Brady, on the faith of Reuss, should have accepted it as a new variety. D'Orbigny states that *N. semirugosa* differs from *N. pyrula* only in the partially costate condition of the base of the chambers; whilst Brady gives as the differences between the two forms that "the walls are thick and the basal aspect of each chamber is decorated externally with raised costæ."

Elsewhere it is by no means so common nor so widely distributed as *N. hispida*. The 'Challenger' Stations are three in the North Atlantic and one near the Philippine Islands, at depths ranging from 95 to 450 fathoms. Flint records two 'Albatross' Stations, both in the Gulf of Mexico, 210 and 227 fathoms respectively.

Nodosaria (*Dentalina*) *soluta* Reuss.

Dentalina soluta Reuss, 1851, Zeitschr. deutsch. geol. Gesell., vol. iii. p. 63, pl. iii. fig. 4. *Nodosaria soluta* (Reuss) Andreae, 1884, Abhandl. geol. Special Karte Elsass-Loth., vol. ii. p. 201, pl. x. fig. 8. *N. soluta* (Reuss) Sherborn and Chapman, 1886, Journ. R. Micr. Soc., ser. 2, vol. vi. p. 746, pl. xiv. figs. 25, 26. *N.* (*D.*) *soluta* (Reuss) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 557, pl. ix. fig. 26. *Dentalina soluta* (Reuss) Wisniowski, 1890, Pamíetník Wydz. iii. Ak. Umiej-Krakowie, vol. xvii. p. 20, pl. viii. figs. 37, 38. *N. soluta* (Reuss) Fornasini, 1890, Mem. R. Accad. Sci. Ist. Bologna, ser. 4, vol. x. p. 469, pl. fig. 8. *N. soluta* (Reuss) Fornasini, 1891, Foraminiferi Pliocenici del Ponticello di Savena, pl. ii. figs. 14, 15. *N. soluta* (Reuss) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. p. 80, pl. ii. fig. 10. *N.* (*D.*) *soluta* (Reuss) Chapman, 1893, Journ. R. Micr. Soc., p. 587, pl. viii. fig. 26. *N. soluta* (Reuss) Goes, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 70, pl. xii. fig. 690. *N. soluta* (Reuss) Egger, 1895, Naturh. Ver. Passau, Jahresber., xvi. p. 21, pl. ii. figs. 6, 15, 16. *N. soluta* (Reuss) Perner, 1897, Česká Akad. Císaře Františka Josefa (Palæont. Bohemiæ No. 4). p. 26, pl. iii. fig. 10. *N. soluta* (Reuss) Egger, 1899, Abhandl.

k. bayer. Akad. Wiss., Cl. II. vol. xxi. p. 59, pl. vi. fig. 23, and pl. vii. fig. iii. *N. soluta* (Reuss) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 310, pl. lvi. fig. 3. *N. soluta* (Reuss) Chapman, 1900. Proc. California Acad. of Sci., ser. 3, Geol., vol. i. p. 248, pl. xxix. fig. 14 *N. soluta* (Reuss) Silvestri, 1900, Mem. Pontif. Accad. Nuovi Lincei, vol. xvii. p. 252, pl. vi. figs. 67, 68.

The difference between the slender *N. pyrula* and the more compact *N. soluta* is only one of degree, and that chiefly in the length and thickness of the stoloniferous tubes. In the original figures by Reuss these are almost as long and as slender as in *N. pyrula*, and one of the examples figured has the later chambers only connected by the tube, which, as before mentioned, is a common feature in *N. hispida*.

In the Malay Archipelago *N. soluta* is of great rarity and has been observed only in Area 1.

Nodosaria capitata Boll, plate XI. fig. 6.

Nodosaria capitata Boll, 1846, Geogn. deutsch. Ostseeländer, p. 177, pl. ii. fig. 13. *Dentalina antennula* d'Orbigny, 1846, For. Foss. Vienne, p. 53, pl. ii. figs. 29, 30; and *D. semicostata*, p. 53, pl. ii. figs. 26, 28. *D. Buchi* Reuss, 1851, Zeitschr. deutsch. geol. Gesell., vol. iii. p. 60, pl. iii. fig. 6; and *D. Philippi*, p. 60, pl. iii. fig. 5. *D. capitata* (Boll) Reuss, 1855, Sitzungsber. k. Akad. Wiss. Wien, vol. xviii. p. 223, pl. i. fig. 4; and 1864 (1865) vol. l. p. 454, pl. i. figs. 8–10. *Nodosaria tholigera* Schwager, 1866, Novara-Exped., Geol. Theil, vol. ii. p. 218, pl. v. fig. 41. *Dentalina* Nos. 149 and 150 Von Schlicht, 1870, Foram. Septarienthones von Pietzpuhl, p. 27, pl. viii. figs. 9, 11. *D. capitata* (Boll) Hantken, 1875 (1876), A magy. kir. földt. int. evkönyve, vol. iv. p. 29, pl. iii. fig. 16. *Nodosaria aciculata* (d'Orb.) Fornasini, 1891, Foraminiferi Pliocenici del Ponticello di Savena, pl. ii. fig. 17. *N. soluta* (Reuss) Silvestri, 1893, Atti e Rendic. Accad. Sci. Lett. e Arti dei Zelanti e P.P. dello Studio di Acireale, vol. v. p. 13, pl. iii. figs. 16, 17. *N. plicosuturata* Dervieux, 1894, Boll. Soc. Geol. Italia, vol. xii. fasc. 4, p. 613, pl. v. fig. 43.

N. capitata, as interpreted by Reuss and other authors, seems to be nothing more nor less than *N. soluta* with the sutures or base of the chambers costate or plicate. *N. capitata*, when so named, is always figured as a test with few chambers, the initial one being larger than those which immediately succeed it; but there is another form composed of numerous chambers and tapering almost to a point at the base. This is well represented by one of Soldani's figures, to which d'Orbigny has given the name of *Dentalina aciculata*.* This form also has the con-

* Ann. Sci. Nat., vol. vii. 1826, p. 255, No. 41.

stricted portions between the chambers costate, and may be considered to represent the microspheric condition of the species. To this latter form may be assigned the *Orthoceratata ritrea*, &c. Soldani;* *Nodosaria intermittens* Roemer;† *Dentalina semicostata* d'Orbigny;‡ *Nodosaria aciculata* (d'Orb.) Fornasini;§ and *Nodosaria* (indet.) Franzenau.‖

There is no previous record of this form in the living condition, and the only example from the Malay Archipelago is the fragment figured; this is from Station 25 in Area 2.

Nodosaria limbata d'Orbigny, plate XI. fig. 7.

Nautilus (*Orthoceras*) *radicula* Batsch, 1791, Conch. Seesands, pl. iii. fig. 10. *Nodosaria limbata* d'Orbigny, 1840, Mém. Soc. Géol. France, sér. 1, vol. iv. p. 12, pl. i. fig. 1. *N. antipodum* Stache, 1864, Novara-Exped., Geol. Theil, vol. i. p. 194, pl. xxii. fig. 19; and *Dentalina pomuligera*, p. 204, pl. xxii. fig. 31. *Dentalina tecta* (Terquem) Tate and Blake, 1876, Yorkshire Lias, p. 459, pl. xviii. fig. 25. *N. limbata* (d'Orb.) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 557, pl. ix. fig. 23. *N. limbata* (d'Orb.) Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xxi. p. 62, pl. xxiv. fig. 41.

In this form the stoloniferous tubes of *N. pyrula* are reduced to a mere collar or band, but the propriety of placing them in the same group can hardly be questioned.

Although d'Orbigny restricts the number of chambers to three or four, there are frequently five in the straight specimens, and a still larger number in the curved examples.

The form is represented by but one example from the Malay Archipelago, and this is from Station 5 in Area 1. This, with Batsch's specimens from an unknown locality, are the only records of the species in the living condition.

Nodosaria bicamerata F. W. O. R. Jones sp., plate XI. fig. 8.

Lagena vulgaris (Will.) var. *bicamerata* F. W. O. R. Jones, 1872, Trans. Linn. Soc., vol. xxx. p. 65, plate xix. figs. 60–62.

Under this name Rymer Jones lumps together several forms which appear to have nothing in common beyond being composed of two chambers. He describes the primordial chamber as "being more or less globular and sometimes compressed," and in some

* Sagg. Critt., 1780, p. 107, pl. v. fig. 41 v.
† Neues Jahrb., 1838, p. 382, pl. iii. fig. 2.
‡ For. Foss. Vienne, 1846, p. 53, pl. ii. figs. 36–38
§ Foram. Plioc. del Ponticello di Savena, 1891, pl. ii. fig. 17.
‖ Glasnik Hrvatsko Naravoslov Društvo, vol. vi. 1894, p. 273, pl. vi. fig. 48.

instances these compressed chambers are provided with a marginal keel.

In the Malay Archipelago examples the exposed portion of the primordial chamber is hemispherical; it is studded with minute tubercles, and bears a small mucro. The terminal chamber is flask-shaped and ornamented with from nine to eleven longitudinal costæ. The neck of this chamber bears a delicate spiral coil, whilst the surface of the body, including the costæ, is minutely aculeated and perforated. In Rymer Jones's fig. 62, which most nearly resembles the Malay examples, the number of costæ is stated to be fourteen.

Probably some of the specimens described by Rymer Jones are really double-celled *Lagenæ*, as the individual chambers have the characters of known species of that genus with which they are associated in the same locality; but in the Malay Archipelago there have been found no *Lagenæ* having cells identical with those of the form here described, hence it may be treated as a true *Nodosaria*.

In the Malay Archipelago it is very rare, and has been observed only at Station 13 in Area 1.

Ry. Jones's specimens were obtained from a sounding ten miles south of Sandalwood Island in the Java Seas at a depth of 1080 fathoms.

Nodosaria proxima O. Silvestri, plate XI. fig. 9.

Nodosaria proxima O. Silvestri, 1872, Atti Accad. Gioenia Sci. Nat., n.s. vol. vii. p. 63, pl. vi. figs. 138–147. *N. proxima* (Silvestri) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. p. 82, pl ii. fig. 17. *N. mutabilis* (Terquem) Crick and Sherborn, 1891, Journ. Northamp. Nat. Hist. Soc., vol. vi. p. 214, pl. vi. figs. 7, 8. *N. proxima* (Silvestri) Fornasini, 1894, Mem. R Accad. Sci. Ist. Bologna, ser. 5, vol. iv. p. 206, pl. i. figs. 33–35. *N. proxima* (Silvestri) Jones, 1896, Palæont. Soc., p. 219, pl. vii. fig. 15 and (1866) pl. iv. fig. 8. *N. scalaris* (Batsch) var. *proxima* (Silv.) A. Silvestri, 1896, Mem. Pontif. Acad. Nuovi Lincei, vol. xii. p. 159, pl. iv. figs. 12–15.

The specimens of this variety are all bilocular and the initial chamber is always larger than that which follows it, in this respect being exactly the reverse of the bilocular form of *N. scalaris*. The examples of *N. proxima* differ from one another in little more than the character of the ornamentation, the costæ of some being few and strong, as in *Lagena sulcata*, whilst in others they are very delicate as in *L. striata*.

It is not uncommon in the Malay Archipelago, being found at several Stations in both areas.

Nodosaria scalaris Batsch sp. var., plate XI. fig. 10.

Nautilus (*Orthoceras*) *scalaris* Batsch, 1791, Conch. Seesands, No. 4, pl. ii. fig. 4. *Nodosaria longicauda* d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 254, No. 28. *N. intersita* Franzenau, 1888, Földt. Közlöny, vol. xviii. p. 172, pl. ii. figs. 1, 2. *N. scalaris* (Batsch) Brady, Parker, and Jones, 1888, Trans. Zool. Soc., vol. xii. p. 223, pl. xliv. figs. 6, 19. *N. scalaris* (Batsch) Fornasini 1889, Minute forme Rizopod. Retic., pl. fig. 24. *N. scalaris* (Batsch) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. p. 82, pl. 2, fig. 15; and *N. raphanus* (Linné) p. 82, pl. ii. fig. 16. *N. scalaris* (Batsch) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 344, pl. xi. figs. 40, 41. *N. scalaris* (Batsch) A. Silvestri, 1893, Mem. Pontif. Accad. Nuovi Lincei, vol. ix. p. 203, pl. v. fig. 4. *N. scalaris* (Batsch) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 73, pl. xiii. figs. 716–718. *N. scalaris* (Batsch) A. Silvestri, 1896, Mem. Pontif. Accad. Nuovi Lincei, vol. xii. p. 156, pl. iv. figs. 5–11; pl. v. fig. 1. *N. scalaris* (Batsch) Fornasini, 1902, Mem. R. Accad. Sci. Ist. Bologna, ser. 5ª, vol. x. p. 34, figs. 27, 28.

Bilocular examples of this species are common in the Malay Archipelago, and on some of these the costæ are very faint whilst on others they are entirely wanting; in this state the form is not to be distinguished from *N. simplex* Silvestri, and this latter may well be regarded as the smooth condition of *N. scalaris*.

As before mentioned, the embryonal chamber of these bilocular forms of *N. scalaris* is always the smaller, as opposed to the arrangement characteristic of *N. proxima*; but this distinction may after all be purely artificial, for taking these bilocular forms, they are assigned to one or other of the species according as one or other of the chambers is the larger, whilst both forms are to be found embodied in the multilocular *N. scalaris* in which the second chamber is usually larger than the embryonal, but is often smaller as in *N. proxima*.

It is one of the commonest of the *Nodosariæ* in the Malay Archipelago and is found at several Stations in both Areas.

Nodosaria scalaris Batsch sp. var. *separans* Brady, plate XI. figs. 11, 12.

Nodosaria separans Batsch sp. var. *separans* Brady, 1884, Chall. Rept., p. 511, pl. lxiv. figs. 16–19. *N. scalaris* var. *separans* (Brady) A. Silvestri, 1893, Mem. Pontif. Accad. Nuovi Lincei, vol. ix. p. 203, pl. iv. fig. 4.

In *N. scalaris* as in *N. hispida* there is a tendency to have some of the chambers separated by a stoloniferous tube.

This variety appears to be very local. It was found only in one

'Challenger' sounding, off the west coast of New Zealand, 275 fathoms; and Brady says that good examples have been dredged on the coast of Kerry. It has been recorded by Joseph Wright at three stations off the south west of Ireland at depths of from 110 to 120 fathoms and is stated by him to be common at one of these Stations. Silvestri's examples were dredged off the east coast of Sicily, 22 to 700 metres.

In the Malay Archipelago it is represented by a few samples from Station 6 in Area 1 and from Station 25 in area 2.

Nodosaria obscura (?) Reuss, plate XI. figs. 13, 14.

Nodosaria obscura Reuss, 1845, Verstein. böhm. Kreide, part 1, p. 26, pl. xiii. fig. 7. *N. obscura* (Reuss) Reuss, 1874, Palæontographica, vol. xx. part 2, p. 81, pl. xx. figs. 1–4. *N. obscura* (Reuss) Berthelin, 1880, Mém. Soc. Géol. France, sér. 3, vol. i. p. 31, pl. xxiv. fig. 17.

Here are two somewhat anomalous specimens which appear to be related to *N. scalaris*. Under the name of *N. obscura* Reuss has described and figured a variable form which in some examples shows no constriction at the sutures throughout the whole of the growth, whilst in other instances the septation of the earlier chambers is indistinct although in the succeeding ones the sutures are deeply sunk. An exaggerated example of this latter form is shown in one of the Malay specimens, fig. 14.

It is with some hesitation that these examples are ascribed to *N. obscura*, but whatever they may be they are interesting forms, and therefore worthy of being recorded.

The only Malay Archipelago Station is No. 22 in Area 2.

Nodosaria raphanus Linné sp.

"Cornu Hammonis erectum striatum" Plancus, 1739, Conch. Min., p. 15, pl. i. fig. 6. *Nautilus raphanus* Linné, 1767, Syst. Nat., 12th ed. p. 1164, No. 283. *Nodosaria raphanus* (Linné), Parker and Jones, 1859, Ann. and Mag. Nat. Hist., ser. 3, vol. iii. p. 477. *N. raphanus* (Linné) Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Sci.) p. 342, pl. xii. fig. 26. *N. raphanus* (Linné) Sherborn and Chapman, 1886, Journ. R. Micr. Soc., ser. 2, vol. vi. p. 749, pl. xiv. figs. 36, 37. *N. raphanus* (Linné) Fornasini, 1890, Mem. R. Accad. Sci. Ist. Bologna, ser. 4, vol. x. p. 470, pl. figs. 24, 25. *N. scalaris* (Batsch) Haeusler, 1890, Abhandl. schweiz. pal. Gesell., vol. xvii. p. 101, pl. xiii. fig. 91; and *N. multicostata* (d'Orb.) p. 102, pl. xiii. fig. 92. *N. raphanus* (Linné) Crick and Sherborne, 1891, Journ. Northamp.

Nat. Hist. Soc., vol. vi. p. 205, pl. i. fig. 11. *N. raphanus* (Linné) Silvestri, 1893, Atti e Rendic. Accad. Sci. Lett. e Arti dei Zelanti e P.P. dello Studio di, Acireale, vol. v. p. 13, pl. ii. figs. 4–7. *N. raphanus* (Linné) Fornasini, 1894, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. iv. p. 204, pl. i. figs. 41–45. *N. raphanus* (Linné) Jones, 1896, Palæont. Soc., p. 213, pl. vi. figs. 9, 10. *N. raphanus* (Linné) Burrows and Holland, 1897, Proc. Geol. Assoc., vol. xv. p. 35, pl. ii. fig. 8. *N. raphanus* (Linné) Perner, 1897, Ceská Akad. Císaře Františka Josefa (Palæont. Bohemiæ No. 4) p. 27, pl. ii. fig. 19.

The Malay examples of this form show little variation. It is common at Station 13 in Area 1, and occurs at a few other Stations in both Areas.

Nodosaria (*D.*) *communis* d'Orbigny.

Nodosaria (*Dentalina*) *communis* d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 254, No. 35. *Dentalina communis* d'Orbigny, 1840, Mém. Soc. Géol. France, sér. 1, vol. iv. p. 13, pl. i. fig. 4. *Nodosaria* (*D.*) *communis* (d'Orb.) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 557, pl. ix. fig. 27. *N. communis* (d'Orb.) Fornasini, 1890, Mem. R. Accad. Sci. Ist. Bologna, ser. 4, vol. x. p. 469, pl. figs. 14–16, 19, 21. *N.* (*D.*) *communis* (d'Orb.) Haeusler, 1890, Abhandl. schweiz. pal. Gesell., vol. xvii. p. 99, pl. xiii. figs. 97, 100, 108. *D. communis* (d'Orb.) Crick and Sherborn, 1891, Journ. Northam. Nat. Hist. Soc., vol. vi. p. 4, pl. i. fig. 13. *N.* (*D.*) *communis* (d'Orb.) Chapman, 1893, Journ. R. Micr. Soc., p. 590, pl. ix. fig. 1. *N.* (*D.*) *communis* (d'Orb.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 342, pl. xi. figs. 22–24. *N. communis* (d'Orb.) Goës, 1894. K. Svenska Vet.-Akad. Handl., vol. xxv. p. 67, pl. xii. figs. 667–671. *N. communis* (d'Orb.) Fornasini, 1894, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. iv. p. 211, pl. i. figs. 8, 9; and p. 214, pl. ii. fig. 2. *D. legumen* (Reuss) = *communis* (d'Orb.) Perner, 1897, Česká Akad. Císaře Františka Josefa (Palæont. Bohemiæ No. 4) p. 35, pl. iii. fig. 5. *N. communis* (d'Orb.) Fornasini, 1898, Mem. R. Accad. Sci. Ist. Bologna ser. 5, vol. vii. p. 209, pl. figs. 11, 13, 14. *N. communis* (d'Orb.) Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xxi. p. 65, pl. vi. fig. 4. *N. communis* (d'Orb.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 310, pl. lvi. fig. 2.

This species occurs in various forms, those with oblique sutures predominating and partaking of the characters of *N. Roemeri* and *N. mucronata*.

It is moderately common in the Malay Archipelago and pretty evenly distributed over the whole of the region.

Nodosaria (*D.*) *farcimen* Soldani sp.

"Orthoceras farcimen" Soldani, 1791, Testaceographia, vol. i. part 2, p. 98, pl. cv. fig. o. *Dentalina farcimen* (Sold.) Reuss, 1863, Bull. Acad. Roy. Belg., sér 2, vol. xv. p. 146, pl. i. fig. 18. *Nodosaria* (*D.*) *farcimen* (Sold.) Howchin, 1888, Journ. R. Micr. Soc., p. 543, pl. ix. fig. 21. *N.* (*D.*) *farcimen* (Sold.) Haeusler, 1890, Abhandl. schweiz. pal. Gesell., vol. xvii. p. 100, pl. xiii. fig. 109; pl. xiv. figs. 24, 25. *N. farcimen* (Sold.) Fornasini, 1890, Mem. R. Accad. Sci. Ist. Bologna, ser. 4, vol. x. p. 463, pl. fig. 13. *N. farcimen* (Sold.) Mariani, 1891, Boll. Soc. Geol. Italia, vol. x. fasc. 2, p. 173, pl. vi. fig. 5. *Dentalina monile* (Hag.) Beissel (Holzapfel) 1891, Abhandl. k. preuss. geol. Landesanst., N.F. Heft 3, p. 31, pl. vi. fig. 31. *N.* (*D.*) *farcimen* (Sold.) Haeussler, 1893, Abhandl. schweiz. pal. Gesell., vol. xx. p. 31, pl. iv. figs. 17–21. *N. farcimen* (Sold.) Fornasini, 1894, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. iv. p. 211, pl. i. figs. 6, 7. *N. farcimen* (Sold.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899), p. 309, pl. lv. fig. 5.

This form occurs in both Areas, but is very rare; the specimens are typical and well developed.

Nodosaria (*D.*) *filiformis* d'Orbigny.

"Orthoceratia filiformia aut capillaria" Soldani, 1798, Testaceographia, vol. ii. p. 35, pl. x. fig. *e*. *Nodosaria filiformis* d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 253, No. 14. *Dentalina* sp. de Folin, 1887, Le Naturaliste, vol. ix. p. 140, fig. 20 *a*. *N. filiformis* (d'Orb.) Fornasini, 1889, Foram. Mioc. di San Rufillo, pl. i. fig. 14. *N.* (*D.*) *filiformis* (d'Orb.) Haeusler, 1890, Abhandl. schweiz. pal. Gesell., vol. xvii. p. 97, pl. xiii. figs. 105, 107. *N.* (*D.*) *filiformis* (d'Orb.) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. p. 79, pl. ii. fig. 7. *N. filiformis* (d'Orb.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899) p. 310, pl. lv. fig. 6.

This also is a very rare form in the Malay Archipelago, and is represented mainly by fragments. The majority of the examples have oblique sutures, resembling plate lxiii. fig. 4 of Brady's 'Challenger' Report.

Lingulina d'Orbigny.

Lingulina limbata sp. n., plate XI. fig. 15.

Primordial chamber oval, surmounted by an expanding neck; surface smooth. Succeeding chamber triangular, compressed, base limbate with a short process on either margin. Aperture oval, in a phialine neck. Length 0·20 mm.

This is one of an aberrant group of *Lingulinæ* in which the chambers, in place of being equitant as in the type, are connected by stoloniferous tubes of more or less slenderness. The test is composed of two or more lageniform chambers arranged in a linear series, the primordial chamber being of a character different from the others.

One of this group was described and figured by Dr. Chester under the name of *L. herdmani.** This was a solitary specimen from shore mud at Southport.

In one of the examples of *L. carinata* figured by Brady † the primordial chamber is armed with a pair of marginal spines at the oral end.

Amongst the abnormal forms of *Nodosaria radicula* figured by Haeusler, two bear a resemblance to this group of *Lingulina*.‡

From my friend Mr. H. Sidebottom, of Cheadle Hulme, I have specimens and drawings of a form closely allied to *L. limbata*, but not identical. Of this he writes, "About 150 specimens were found in the material from off the coast of the Island of Delos (Grecian Archipelago), depth 8 to 14 fathoms, by my brother-in-law Mr. C. H. Nevill and myself. In six cases there is a third chamber similar to the second, only rather larger. The species occurs at other parts of the Mediterranean very rarely, also from the Seychelles Islands."

L. limbata is very rare in the Malay Archipelago, and has been found only at Station 6 in Area 1.

Lingulina pagoda sp. n., plate XI. figs. 16, 17.

Test linear. Primordial chamber flask-shaped with longitudinal costæ. Succeeding chambers pyriform, compressed, broad at the base, which is encircled by a tubuliferous fringe. Aperture oval, in a phialine neck. Length 0·50 mm.

This curious form may be said to be compounded of an initial cell resembling *Lagena sulcata*, from which proceeds a series of cells each of which has somewhat of the characters of *L. fimbriata*, the base of each being attached to the phialine neck of the preceding, and each successive chamber increasing slightly in size.

This form also is very rare in the Malay Archipelago, and has been observed only at Station 6 in Area 1.

Fig. 18 represents a detached chamber found at Station 30 in Area 2, which indicates a species distinct from those described. The length of the chamber is 0·15 mm.

* First Rept. of the Southport Soc. of Nat. Sci., 1890–91 (1892) p. 63, pl. i. fig 9.
† Chall. Rept., 1884, p. 517, pl. lxv. fig. 17.
‡ Abhandl. schweiz. pal. Gesell., vol. xvii. 1890, p. 92, pl. xiii. figs. 56-59.

Frondicularia Defrance.

Frondicularia nitida Terquem, plate XI. fig. 19.

Frondicularia nitida Terquem, 1858, Mém. Acad. Imp. de Metz, vol. xxxix. p. 592, pl. i. fig. 9. *F.* cf. *nitida* (Terq.) Uhlig, 1883, Jahrb. k. k. geol. Reichs., vol. xxxiii. p. 756, pl. ix. fig. 19. *F. nitida* (Terq.) Burbach, 1886, Zeitschr. Naturw. Halle, vol. lix. p. 45, pl. i. fig. 7. *F. spathulata* (Brady) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 346, pl. xi. fig. 32.

Of this almost extinct genus Mr. Durrand's collection yields but a single individual; this is from Station 30 in Area 2.

This form, with slight variations, is common in the lias, and has received a variety of names. Its nearest living representative appears to be the *F. spathulata* of Brady.* The solitary specimen found by Dr. Egger in the 'Gazelle' Soundings, and attributed by him to *F. spathulata*, seems to correspond in all respects with the Malay Archipelago example.

Rhabdogonium Reuss.

Rhabdogonium tricarinatum d'Orbigny sp.

Vaginulina tricarinata d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 258, No. 4; Modèle, No. 4. *Rhabdogonium tricarinatum* (d'Orb.) Brady, 1884, Chall. Rept., p. 525, pl. lxvii. figs. 1–3. *R. tricarinatum* (d'Orb.) Sherborn and Chapman, 1886, Journ. R. Micr. Soc., ser. 2, vol. vi. p. 752, pl. xv. fig. 16. *R. tricarinatum* (d'Orb.) Brady, Parker, and Jones, 1888, Trans. Zool. Soc., vol. xii. p. 223, pl. xlv. fig. 3. *R. tricarinatum* (d'Orb.) Schrodt, 1890, Zeitschr. deutsch. geol. Gesell., vol. xlii. p. 411, pl. xxii. fig. 2. *R. tricarinatum* (d'Orb.) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 558, pl. x. fig. 7. *R. tricarinatum* (d'Orb.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 355, pl. xi. figs. 49, 50; pl. xii. figs. 36-38. *R. tricarinatum* (d'Orb.) Jones, 1895, Palæont. Soc., p. 232, pl. vii. fig. 16. *R. tricarinatum* (d'Orb.) Egger, 1895, Naturhist. Ver. Passau, Jahresber. xvi. p. 23, pl. ii. figs. 18, 19. *R. tricarinatum* (d'Orb.) Silvestri, 1896, Mem. Pontif. Accad. Nuovi Lincei, vol. xii. p. 194, pl. i. fig. 8 (vol. xv. 1899).

This form occurs sparingly at a few Stations in both areas. All the examples are twisted and have a produced neck.

Brady states that it has not been noticed at any point in the North Pacific.

* Quart. Journ. Micr. Sci., n.s. vol. xix. 1879, p. 270, pl. viii. fig. 5.

Marginulina d'Orbigny.

Marginulina glabra d'Orbigny.

Marginulina glabra d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 259, No. 6; Modèle, No. 55. *M. attenuata* (Neug.) Sherborn and Chapman, 1889, Journ. R. Micr. Soc., p. 487, pl. xi. fig. 27. *M. glabra* (d'Orb.) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 558, pl. x. fig. 1. *M. glabra* (d'Orb.) Haeusler, 1890, Abhandl. schweiz. pal. Gesell., vol. xvii. p. 106, pl. xiv. figs. 35–40, 42, 43. *M. glabra* (d'Orb.) Fornasini, 1890, Mem. R. Accad. Sci. Ist. Bologna, ser. 4, vol. x. p. 470, pl. figs. 20, 26–30. *M. glabra* (d'Orb.) Mariani, 1891, Boll. Soc. Geol. Italia, vol. x. p. 173, pl. vi. fig. 6. *M. elongata* (d'Orb.) Perner, 1892, Česká Akad. Císaře Františka Josefa (Palæont. Bohemiæ No. 1) p. 61, pl. v. figs. 13, 14. *M. glabra* (d'Orb.) Egger, 1893, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xviii. p. 346, pl. xi. figs. 28, 29. *M. glabra* (d'Orb.) Chapman, 1894, Journ. R. Micr. Soc., p. 160, pl. iv. fig. 11. *Vaginulina glabra* (d'Orb.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. pl. xi. figs. 659–661. *M. glabra* (d'Orb.) Jones, 1896, Palæont. Soc., p. 233, pl. i. fig. 26 (1866). *M. glabra* (d'Orb.) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899), p. 313, pl. lx. fig. 1.

This form is moderately common in the Malay Archipelago and appears at several Stations in both Areas. The examples are short and inflated, and in most cases have but two chambers.

Marginulina costata Batsch sp., plate XI. fig. 20.

Nautilus (*Orthoceras*) *costatus* Batsch, 1791, Conch. Seesands, pl. i. fig. 1. *Marginulina raphanus* (Linné) d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 258, No. 1, pl. x. figs. 7, 8; Modèle, No. 6. *M. costata* (Batsch) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. p. 92, pl. iii. fig. 4. *Cristellaria* (*Marginulina*) *costata* Hosius, 1892, Verhandl. Nat. Ver. Preuss. Rheinl. Westph., Jahrg. xlix. p. 184, pl. ii. fig. 22; and *raricosta*, p. 124, pl. ii. fig. 23. *M. costata* (Batsch) Fornasini, 1893, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. iii. p. 434, pl. ii. fig. 6; and 1894, ser. 5, vol. iv. pp. 213, 214, 217, pl. ii. figs. 18–21. *Nodosaria raphanus* (Linné) Dervieux, 1893, Boll. Soc. Geol. Italia, vol. xii. p. 621, pl. v. figs. 56, 57. *M. costata* (Batsch) Egger, 1895, Naturhist. Ver. Passau, Jahresber. xvi. p. 23, pl. ii. fig. 17. *M. costata* (Batsch) Jones, 1896, Palæont. Soc., p. 235, pl. i. fig. 21 (1866, *M. raphanus*) (d'Orb.). *M. costata* (Batsch) Silvestri, 1896, Mem. Pontif. Accad. Nuovi Lincei, vol. xii. p. 200, pl. i. fig. 9. *M. costata* (Batsch) Fornasini, 1897–98, Rendic. R. Accad. Sci. Ist. Bologna, n.s. vol.

ii. p. 5, pl. i. fig. 3. *M. costata* (Batsch) Silvestri, 1900, Mem. Pontif. Accad. Nuovi Lincei, vol. xvii. p. 273, pl. vi. fig. 22.

This species occurs in two forms, one short and inflated with a few strong ribs; the other elongate with numerous and delicate costæ as shown in the illustration.

It is moderately common at Station 30 in Area 2, and appears at a few stations in Area 1.

Brady states that with the exception of a few small examples from off the coast of New Zealand, it has not been observed in either the North or South Pacific, the Southern Ocean, or the Red Sea.

Vaginulina d'Orbigny.

Vaginulina legumen Linné sp. var., plate XI. fig. 21.

Nautilus legumen Linné, 1767, Syst. Nat., 12th ed. p. 1164, No. 288. *Vaginulina legumen* (Linné) d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 257, No. 2. *V. legumen* var. *lævigata* (Röm.) Jones, 1884, Quart. Journ. Geol. Soc., vol. xl. p. 769, pl. xxxiv. fig. 5. *V. legumen* (Linné) Sherborn and Chapman, 1886, Journ. R. Micr. Soc., ser. 2, vol. vi. p. 753, pl. xv. fig. 19; and Ibid., 1889, p. 487, pl. xi. fig. 25. *V. legumen* (Linné) Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 559, pl. x. fig. 16. *V. legumen* (Linné) Haeusler, 1890, Abhandl. schweiz. pal. Gesell., vol. xvii. p. 107, pl. xiv. fig. 49. *V. legumen* (Linné) Crick and Sherborn, 1891, Journ. Northamp. Nat. Hist. Soc., vol. vi. p. 4, pl. vi. fig. 15. *V. legumen* (Linné) Terrigi, 1891, Mem. R. Com. Geol. Italia, vol. iv. p. 94, pl. iii. fig. 6. *V. lævigata* (Röm.) Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv. p. 65, pl. xi. figs. 648–655. *V. lævigata* (Röm.) Jones, 1896, Palæont. Soc., p. 227, pl. v. fig. 8. *V. legumen* (Linné) Bagg, 1898, Bull. U.S. Geol. Survey, No. 88, p. 53, pl. iv. fig. 4. *V. legumen* (Linné) Flint, 1899, Rep. U.S. Nat. Mus. for 1897 (1899), p. 314, pl. lx. fig. 2. *V. legumen* (Linné) Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. II. vol. xxi. p. 98, pl. ix. figs. 29, 30; and *V. denudata* (Reuss) p. 100, pl. ix. figs. 29, 30.

A very rare form in the Malay Archipelago and has been found only in Area 2.

Most of the examples are normal, but the variety figured approaches *Cristellaria crepidula*, whilst the inflated terminal chamber suggests an affinity with the dimorphous genus *Amphicoryne*.

Vaginulina formosa sp. n., plate xi. fig. 22.

Test oblong, tapering towards the apertural end; aboral end broad and rounded; dorsal margin thin and carinate; ventral

margin broad and inflated; chambers few in number, triangular, radiating from a point at the aboral extremity of the test. Sutures obscure; surface covered with costæ parallel with the sutures. Aperture in a produced neck. Length 0·47 mm.

This is a passage form from *Vaginulina* to *Cristellaria* and is interesting as being a survival from the mesozoic period. In the lias and more especially in the oolite, types similar in character were extremely abundant, and a multitude of them has been figured by Terquem in his various works on the foraminifera of those formations.

There is but a single specimen from the Malay Archipelago, and this is from Station 25 in Area 2.

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CONTAINING ITS TRANSACTIONS AND PROCEEDINGS

AND

A SUMMARY OF CURRENT RESEARCHES RELATING TO

ZOOLOGY AND BOTANY

(principally Invertebrata and Cryptogamia)

MICROSCOPY, &c.

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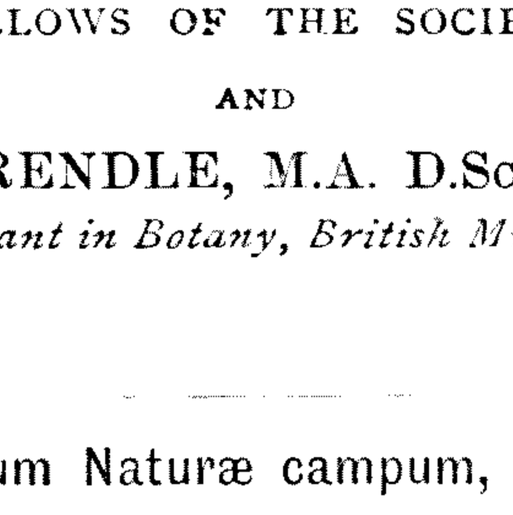

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