

XIV.—*A Synopsis of the British Recent Foraminifera.*

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*(Read 9th November, 1887.)*

NEARLY thirty years have elapsed since the publication of Prof. W. C. Williamson's memoir on the 'Recent Foraminifera of Great Britain'—a work in which the scattered threads of earlier investigation were collected into an orderly skein, and interwoven with the results of a large amount of independent research. Whatever be its imperfections—and, considering the circumstances of the time, they are fewer and less important than might reasonably have been anticipated—that memoir represents fully and adequately the state of knowledge with respect to the organisms of which it treats up to the date of its publication, and practically marks the commencement of the recognition of the recent Foraminifera of the British Islands as a distinct branch of study.

The material to which Prof. Williamson had access consisted chiefly of shore-sands from various parts of the coast, together with a few dredgings obtained by the late Mr. Barlee and the late Mr. Jeffreys from the Shetland Seas, the western shores of Scotland, and one or two points on the south-west coast of England—all from comparatively shallow water. Of recent years, thanks partly to the periodical money-grants of the British Association, partly to the organization of local field-clubs, and most of all to the enthusiasm of amateur naturalists, the area of research has been vastly widened, and at the present time there are few promising portions of our coast that have not been explored more or less by means of the dredge; and our knowledge of every section of the marine invertebrate fauna has been correspondingly enriched.

So far as the Foraminifera are concerned, the additions to the British list have been so numerous as to be bewildering, notwithstanding the efforts that have been made from time to time by means of catalogues, printed privately or otherwise, to keep pace with the record of fresh occurrences. The latest catalogue of this sort, that drawn up by Mr. Siddall in 1879, though complete or approximately so when issued, even now requires an amount of revision that much diminishes its practical value. The recent dredging operations on the south-west of Ireland have added to our list a number of the deep-water species that venture within the limits assigned to the British area; and we seem to have arrived at a point from which we may profitably review our position. Whether the time has yet come for a fresh attempt to treat the subject fully and exhaustively, as was done by Prof. Williamson, may be open to question; but if so, the present paper can in no way prejudice such an effort—indeed it has been intended in some measure as a preliminary step in that direction, the aim having been to collect and sift existing material, and to draw attention to some of the numerous points concerning which our knowledge is defective.

The employment of modern dredging appliances, and the prosecution of researches in deeper water and further from land than was customary a few years ago, have opened a new question, namely,—what is to be understood by the term "British," as applied to the marine fauna and

flora? This subject was raised in the Biological Section of the British Association at the Birmingham meeting in 1886, and a Committee was appointed to consider it and report. The report, laid before the Manchester meeting (1887), which may be summarized as follows, will probably find general acceptance. It proposes to recognize a "British Marine Shallow-water District," and a "British Atlantic Slope District;" the former bounded to east and south by the half-way line between Great Britain and the continent of Europe, and to the west and north by the 100 fathom line, which corresponds roughly with the beginning of the declivity of the continental plateau; the latter, that is the "British Atlantic Slope District," extending from the 100 fathom line on the north and west coasts to say 1000 fathoms, that is to the commencement of the abyssal floor of the ocean.

These definitions are doubtless intended for general guidance rather than as the embodiment of fixed and absolute rules; and in the following Synopsis, which is otherwise limited to the "Shallow-water District," I have not felt at liberty to exclude the results of some of the recent dredgings on the south-west of Ireland at depths a little exceeding 100 fathoms; still less those of soundings from even deeper water in localities like Loch Fyne, which are geographically within the normal 100 fathom line.

The arrangement and nomenclature of the Synopsis are based upon the 'Report on the Foraminifera of the Challenger Expedition.' Reference is given to the original description of each species and, as far as possible, a further reference to the first record of its occurrence in a British locality, not, however, in the latter case going back further than Williamson's monograph. For synonyms, which have only been given in a few needful cases, the reader may be referred to the 'Challenger' Report.

I have had the advantage of the assistance of my friend Mr. W. Archer, F.R.S., of Dublin, with respect to the Gromidæ. The treatment of the Family, however, must be regarded as purely provisional. Those genera only have been included that are known to possess "reticulated" (as distinct from "lobose" or "filose") pseudopodia.

There are a certain number of species that, at one time or other, have found place in works on the British recent fauna, which are omitted in the present Synopsis. Of these the most important are *Peneroplis planatus* and *Vertebralina striata*, the specimens of which are now known to have been interlopers, due to the use of sieves previously employed for Mediterranean sands, and not properly cleaned; *Cristellaria strigilata* (*C. subarcuatula*, var. *costata*, Will.), *Frondicularia complanata* (*F. spathulata*, Will.), *Frondicularia archiaciana*, and *Nummulites radiata* (*N. planulata*, Will.), which are without doubt "derived" fossils from early Tertiary and Cretaceous strata. Possibly the broken specimen figured by Williamson (Plate ii., fig. 44), referred with reservation by some subsequent authors to *Nodosaria raphanistrum*, also pertains to the same category.

With respect to *Nummulites radiata*, I may say that the late Mr. Jeffreys was kind enough to give me a considerable number of the specimens dredged off Portsmouth, and their fossil condition appears to



admit of no question. I am informed by Prof. Williamson that the Scarborough specimen has been lost, but that it was of precisely similar character. A mounting from the Portsmouth gathering has been placed with the series of British Foraminifera in the British Museum.

There are a few other names that will not be found in their old places, partly owing to needful generic changes; of these the following are the more important:—

*Biloculina contraria* and *Hauerina compressa*—are now transferred to *Planispirina contraria*.

*Reophax moniliforme*, is referred to *R. findens*.

*Textularia difformis*—to *Bolivina difformis*.

*Textularia pygmæa*—to *Bolivina dilatata*.

*Cassidulina pulchella* and *Cassidulina oblonga*,—to *C. lævigata* and *C. crassa* respectively.

*Lagena jeffreysii*—to *L. hispida*.

*Lagena lyellii*—to *L. sulcata* and *L. costata*.

*Nodosaria* (Dent.) *guttifera*,—referred to *N. pyrula*.

*Marginulina lituus*—to *Cristellaria elongata*.

*Polymorphina orbignii*.—Fistulose specimens of *Polymorphina* are associated with the forms to which they respectively belong, and not treated collectively as a single species.

*Discorbina obtusa*—has been transferred to *D. wrightii*.

*Discorbina ochracea*—to *Trochammina ochracea*.

*Pulvinulina sacculata*.—The locality given by Messrs. Parker and Jones for this form—50 miles south-west of Ushant—is outside the British area.

Attention may be directed to certain species and varieties which have been retained in the list, but concerning which considerable uncertainty still exists; namely,—*Valvulina conica*, *Trochammina macrescens*, *Tr. plicata*, *Bathysiphon filiformis*, *Placopsilina bulla*, *P. varians*, *Reophax findens*, *Ramulina globulifera*, *Spirillina tuberculata*, *Nonionina boueana*, and *N. asterizans*. Further observations are still required on these, as well as on a few other forms that need not here be enumerated, to place our knowledge of their characters and distribution on a satisfactory footing.

I have now only to thank most cordially the naturalists who have aided me with notes and suggestions embodied in the following pages. I have already expressed the obligation I am under to Mr. Archer, and my acknowledgments are also due in an especial manner to Messrs. Joseph Wright, F.G.S., of Belfast, F. W. Millett, F.R.M.S., of Marazion, and David Robertson, F.G.S., of Millport, N.B., whose labours in connection with the British marine Rhizopoda are widely known, for much assistance, ever most kindly and freely rendered. To the friendly co-operation of these gentlemen any claim the present Synopsis may have to approximate completeness is largely due.

BIBLIOGRAPHY.

The following list embraces only such works on the British Recent Foraminifera as have been employed in the compilation of the present Synopsis, commencing with Prof. Williamson's Monograph in 1858; and is not in any way intended as a complete bibliography even of the limited field to which it refers.

1858. WILLIAMSON, W. C.—On the Recent Foraminifera of Great Britain. (Ray Society.)
1862. PARKER, W. K., and JONES, T. RUPERT.—Appendix to Carpenter's 'Introduction to the Study of the Foraminifera,' pp. 309–312.
1863. BRADY, HENRY B.—Notes on Foraminifera new to the British Fauna. (Report Brit. Assoc., Newcastle-upon-Tyne Meeting, Trans., pp. 100, 101.)
1864. ——— ——— On the Rhizopodal Fauna of Shetland. (Trans. Linn. Soc. Lond., vol. xxiv. pp. 463–475, pl. xlviii.)
1865. ——— ——— A Catalogue of the Recent Foraminifera of Northumberland and Durham. (Nat. Hist. Trans. Northd. and Durham, vol. i. pp. 83–107, pl. xii.)
1865. ALCOCK, Dr. T.—Notes on Natural History Specimens lately received from Connemara. (Proc. Lit. and Phil. Soc. Manchester, vol. iv. pp. 192–208.)
1866. BRADY, HENRY B.—On the Rhizopodal Fauna of the Hebrides. (Report Brit. Assoc., Nottingham Meeting, Trans., pp. 69, 70.)
1867. WALLER, EDWARD.—Report on the Foraminifera obtained in the Shetland Seas. (Report Brit. Assoc., Dundee Meeting, pp. 441–446.)
1870. BRADY, HENRY B.—On Brackish-water Foraminifera. (Ann. and Mag. Nat. Hist., Ser. 3, vol. vi. pp. 273–309, pl. xi., xii.)
1870. ——— ——— Catalogue of British Foraminifera in the Edinburgh Museum of Science and Art.
1870. ARCHER, WILLIAM.—On some Freshwater Rhizopoda, new or little-known. (Quart. Journ. Micr. Sci., vol. x. N.S. pp. 101–124;—vol. ix. pl. xx.)
1870. CARTER, H. J.—On two New Species of the Foraminiferous Genus *Squamulina*, and on a New Species of *Diffugia*. (Ann. and Mag. Nat. Hist., Ser. 4, vol. v. pp. 309–326, pl. iv., v.)
1874. ROBERTSON, DAVID.—Notes on the Recent Foraminifera and Ostracoda of the Firth of Clyde. (Trans. Geol. Soc., Glasgow, vol. v. pp. 112–154.)
1875. ——— ——— (G. S. Brady and Robertson), Report on Dredging off the Coast of Durham and North Yorkshire in 1874. (Report Brit. Assoc., Bristol Meeting, pp. 185–199.)
1877. ARCHER, WILLIAM.—Résumé of Recent Contributions to our Knowledge of Freshwater Rhizopoda. Part. IV. (Quart. Journ. Micr. Sci., vol. xvii. N.S., pp. 107–124, pl. viii.)
1877. WRIGHT, JOSEPH.—Recent Foraminifera of Down and Antrim. (Proc. Belfast Nat. Field Club, 1876–77, Appendix, pp. 101–105, pl. iv.)
1878. SIDDALL, J. D.—The Foraminifera of the River Dee. (Proc. Chester Soc. Nat. Science, pt. ii., pp. 42–56, woodcuts.)
1879. ——— ——— Catalogue of British Recent Foraminifera, for the use of collectors, pp. 10.
1880. ——— ——— On Shephardella, an Undescribed Type of Marine Rhizopoda, with a few Observations on Lieberkuehnia. (Quart. Journ. Micr. Sci., vol. xx. N.S. pp. 130–144, pl. xv., xvi.)
1880. ROBERTSON, DAVID.—Remarks on a few hauls with the Dredge in Portree Bay, Skye. (Proc. Nat. Hist. Soc. Glasgow, vol. v. pp. 11–13; also 1881–1883—further notes at pp. 17, 107, 163, 268 and 274 of the same volume).



1881. ARCHER, WILLIAM.—A New Sarcodine, possibly to be referred to the Genus *Microgromia*. (Ann. and Mag. Nat. Hist., ser. 5, vol. viii. pp. 230, 231.)
1881. WRIGHT, JOSEPH.—Foraminifera found during the Belfast Naturalists' Field Club's Excursion to South Donegal, 1880. (Proc. Belfast Nat. Field Club, 1880–81, Appendix, pp. 179–187, pl. viii.)
1884. BALKWILL, F. P., and MILLETT, F. W.—The Foraminifera of Galway. Journ. Microsc. and Nat. Sci., vol. iii. pp. 19–28; pp. 78–90, pl. i.–iv.)
1885. BALKWILL, F. P., and WRIGHT, JOS.—Report on some recent Foraminifera found off the Coast of Dublin and in the Irish Sea. (Trans. R. Irish Acad., vol. xxviii. [Science] pp. 317–372, pl. xii.–xiv.)
1885. MILLETT, F. W.—The Recent Foraminifera of Mount's Bay. (Trans. Penzance Nat. Hist. and Antiq. Soc., N.S. vol. ii. pp. 26–28.)
1886. WRIGHT, JOSEPH.—First Report on the Marine Fauna of the South-west of Ireland. (Proc. R. Irish Acad., ser. 2, vol. iv. [Science]—Foraminifera, pp. 607–614.)
1886. ———— Foraminifera of the Belfast Naturalists' Field Club's Cruise off Belfast Lough, in the Steam-tug 'Protector,' June, 1885; also Foraminifera found by Dr. Malcomson at Rockport, Belfast Lough. (Proc. Belfast Nat. Field Club, 1885–86, Appendix, pp. 317–325, pl. xxvi.)
1886. SIDDALL, J. D.—Report on the Foraminifera;—Liverpool Marine Biological Committee Report, No. 1. (Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, pp. 42–71, pl. i.)

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SUB-KINGDOM—PROTOZOA.

CLASS—RHIZOPODA.

ORDER—Foraminifera (*Reticularia*).

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Family I. GROMIDÆ.

LIEBERKUEHNIA, Claparède and Lachmann.

*Lieberkuehnia wagneri*, Claparède and Lachmann.

*Lieberkuehnia wagneri*, Clap. and Lach., 1859, Mém. de l'Institut genevois, vol. vi. ;—1868, Études des Infusoires, pt. ii. p. 465, pl. xxiii.

” ” Siddall, 1879, Catal. Brit. Rec. Foram., p. 10;—1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl., Appendix, p. 48.

“ Colwyn Bay, near Little Orme's Head, on Algæ and Hydrozoa. &c., from low water ” (Siddall).

GROMIA, Dujardin.

*Gromia oviformis*, Dujardin.

*Gromia oviformis*, Dujardin, 1835, Ann. Sci. Nat., sér. 2, vol. iii. p. 313;—vol. iv. p. 343, pl. ix. fig. 1.

” ” Siddall, 1879, Catal. Brit. Rec. Foram., p. 3;—1886, Proc. Lit. and Phil. Soc. Liverpool, vol. xl., Appendix, p. 49.

“ Muddy shores around the coast generally ” (Siddall).

*Gromia dujardini*, Schultze.

*Gromia dujardini*, Schultze, 1854, Organ. Polythal., p. 55, pl. vii. figs. 1-7.

„ „ Siddall, 1879, Catal. Brit. Rec. Foram., p. 3;—  
1886, Proc. Lit. and Phil. Soc. Liverpool, vol. xl., Appendix, p. 49.

“Muddy shores around the coast generally,” with the last-named species (Siddall).

MICROGROMIA, R. Hertwig.

*Microgromia socialis*, Archer.

*Gromia socialis*, Archer, 1870, Quart. Journ. Micr. Sci., vol. x. N.S. p. 124; vol. ix., pl. xx. figs. 7-11.

*Microgromia socialis*, Id. 1877, Ibid., vol. xvii. N.S. p. 115; pl. viii. fig. 8.

Glen-ma-lur Valley,—Co. Wicklow, and in some other subalpine districts in Ireland, rare (Archer).

*Microgromia mucicola*, Archer.

*Microgromia mucicola*, Archer, 1877, Quart. Journ. Micr. Sci., vol. xvii. N.S. p. 121, pl. viii. fig. 9.

“Nidulates in mucous envelope of certain unicellular Algæ” (Archer).

*Microgromia ambigua*, Archer.

*Microgromia ambigua*, Archer, 1881, Ann. and Mag. Nat. Hist., ser. 5, vol. viii. p. 230.

“Only probably belonging to this genus. Not rare in Midland pools, Ireland” (Archer).

DIAPHOROPODON, Archer.

*Diaphoropodon mobile*, Archer.

*Diaphoropodon mobile*, Archer, 1870, Quart. Journ. Micr. Sci., vol. x. N.S. p. 123; vol. ix. pl. xx. fig. 6.

Glen-ma-lur Valley,—Co. Wicklow, very rare (Archer).

SHEPHEARDELLA, Siddall.

*Shepherdella tæniiformis*, Siddall.

*Shepherdella tæniiformis*, Siddall, 1880, Quart. Journ. Micr. Sci., vol. xx. N.S. p. 130, pls. xv., xvi.

„ „ Id. 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl., Appendix, p. 49.

“On Hydrozoa dredged in Colwyn Bay. Frequent in spring at Tenby” (Siddall).

1887.

## Family II. MILIOLIDÆ.

## Sub-family 1. Nubecularinæ.

## SQUAMULINA, Schultze.

*Squamulina lævis*, Schultze.

*Squamulina lævis*, Schultze, 1854, Organ. der Polythal., p. 56, pl. vi. figs. 16, 17.

„ „ Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl., Appendix, p. 50.

“Occurring on the polypidoms of zoophytes round the coast generally” (Siddall).

## NUBECULARIA, Defrance.

*Nubecularia lucifuga*, Defrance.

*Nubecularia lucifuga*, Defrance, 1825, Dict. Sci. Nat., vol. xxv. p. 120;—Atlas Zooph., pl. xlv. fig. 3.

„ „ Brady, 1879. Siddall's Catal. Brit. Rec. Foram., p. 10.

Cornwall coast, 60 fathoms; off Guernsey, dredged (Brady); Mouth of the Dee? (Siddall); Mount's Bay (Millett); Kilchattan Bay, Bute, 25 fathoms (Robertson).

## Sub-family 2. Miliolininæ.

## BILOCULINA, d'Orbigny.

*Biloculina irregularis*, d'Orbigny.

*Biloculina irregularis*, d'Orbigny, 1839, Foram. Amér. Mérid., p. 67, pl. viii. figs. 20, 21.

Small specimens, apparently belonging to this form, occur in dredged sands from the Hebrides.

*Biloculina sphæra*, d'Orbigny.

*Biloculina sphæra*, d'Orbigny, 1839, Foram. Amér. Mérid., p. 66, pl. viii. figs. 13–16.

„ „ Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 466, pl. xlvi. fig. 1.

Shetland, Hebrides, dredged (Brady); south-west of Ireland, 79 to 200 fathoms (Wright).

*Biloculina ringens*, Lamarck, sp.

*Miliolites ringens*, Lamarck, 1804, Ann. du Muséum, vol. v. p. 351, No. 1;—vol. ix. pl. xvii. fig. 1.

*Biloculina ringens*, Williamson, 1858, Rec. For. Gt. Br., p. 79, pl. vi. figs. 169, 170.

Common all round the coast.



*Biloculina depressa*, d'Orbigny.

*Biloculina depressa*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 298, No. 7;—Modèle, No. 91.

„ *ringens*, var. *carinata*, Williamson, 1858, Rec. For. Gt. Br., p. 79, pl. vii. figs. 172–174.

Common everywhere.

*Biloculina elongata*, d'Orbigny.

*Biloculina elongata*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 298, No. 4;—Soldani, Testac., vol. i. pt. 3, p. 228, pl. cliii. fig. M, Q; p. 231, pl. clvi. fig. *v v*.

„ *ringens*, var. *patagonica*, Williamson, 1858, Rec. For. Gt. Br., p. 80, pl. vii. figs. 175–6.

A common shallow-water form, hardly distinguishable varietally from *B. ringens*.

SPIROLOCULINA, d'Orbigny.

*Spiroloculina planulata*, Lamarck, sp.

*Miliolites planulata*, Lamarck, 1805, Ann. du Muséum, vol. v. p. 352, No. 4;—1822, Anim. s. Vert., vol. vii. p. 613, No. 4.

*Spiroloculina depressa*, var. *rotundata*, Williamson, 1858, Rec. For. Gt. Br., p. 82, pl. vii. fig. 178.

A common shallow-water form.

*Spiroloculina limbata*, d'Orbigny.

*Spiroloculina limbata*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 299, No. 12;—Soldani, Testac., vol. ii. p. 54, pl. xix. fig. *m*.

„ *depressa*, Williamson, 1858, Rec. For. Gt. Br., p. 82, pl. vii. fig. 177.

Widely distributed.

*Spiroloculina tenuiseptata*, Brady.

*Spiroloculina tenuiseptata*, Brady, 1884, 'Challenger' Report, p. 153, pl. x. figs. 5, 6.

Common in Mr. Wright's dredgings from the south-west of Ireland.

*Spiroloculina acutimargo*, Brady.

*Spiroloculina acutimargo*, Brady, 1884, Challenger Report, p. 154, pl. x. figs. 12–15.

„ „ Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science), p. 323, wood-cut.

Lambay, 45 fathoms, specimens small and poor (Balkwill and Wright); Estuary of the Dee (Siddall).

*Spiroloculina canaliculata*, d'Orbigny.

*Spiroloculina canaliculata*, d'Orbigny, 1846, For. Foss. Vien., p. 269, pl. xvi. figs. 10–12.



*Spiroloculina depressa*, var. *cymbium*, Williamson, 1858, Rec. For. Gr. Br., p. 82, pl. vii. fig. 179.  
Frequent.

*Spiroloculina excavata*, d'Orbigny.

*Spiroloculina excavata*, d'Orbigny, 1846, For. Foss. Vien., p. 271, pl. xvi. figs. 19–21.

„ „ Brady, 1865, Nat. Hist. Trans. Northd. and Durham, vol. i. p. 93, pl. xii. fig. 1.

Widely distributed, but less common than some other species of the genus.

MILIOLINA, Williamson.

Here, as in the 'Challenger' Report, I have retained the generic term *Miliolina* in the sense in which it is employed by Williamson. I do not, I hope, in the least underrate the value and importance of the researches of MM. Munier-Chalmas and Schlumberger on the embryology of the group, but I confess I am unable, in the present state of our knowledge, to see any way to the application of embryological characters to a practical and convenient system of generic nomenclature. So far as I understand, it is admitted that, whilst general rules may be laid down with relation to the embryological differences of certain subordinate groups, the "distinctive" features have a considerable range of variation, and are in fact not much more constant than those more easily recognized external peculiarities which serve as the basis of classification amongst other Foraminifera. We have, however, still much to learn in the matter, and everything to hope from M. Schlumberger's further investigations. Perhaps the difficulty may be eventually solved by the recognition of certain subgeneric types; the d'Orbignyan genus *Adelosina*, for example, represented in the British list by *Miliolina bicornis*, appears to be readily distinguishable, under ordinary circumstances, by external as well as internal characters.

*Miliolina trigonula*, Lamarck, sp.

*Miliolites trigonula*, Lamarck, 1804, Ann. du Muséum., vol. v. p. 351 No. 3;—1822, Anim. s. Vert., vol. vii. p. 612, No. 3.

*Miliolina trigonula*, Williamson, 1858, Rec. For. Gt. Br., p. 84, pl. vii. figs. 180–182.

Generally distributed.

*Miliolina tricarinata*, d'Orbigny, sp.

*Triloculina tricarinata*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 299, No. 7;—Modèle, No. 94.

„ „ Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 466, pl. xlviii. fig. 3.

Shetland (Brady, Waller); Estuary of the Dee (Siddall); Mount's Bay (Millett); various points on the coast of Ireland (Wright, Balkwill and Wright, Balkwill and Millett); west of Scotland (Robertson).

*Miliolina insignis*, Brady.

*Miliolina insignis*, Brady, 1884, Challenger Report, p. 165, pl. iv. figs. 8-10.

” ” Wright, 1886, Proc. Belfast Nat. Field Club, 1885-6, Appendix, p. 319, pl. xxvi. fig. 4.  
Belfast Lough, 60 fathoms (Wright).

*Miliolina oblonga*, Montagu, sp.

*Vermiculum oblongum*, Montagu, 1803, Test. Brit., p. 522, pl. xiv. fig. 9.

*Miliolina seminulum*, var. *oblonga*, Williamson, 1858, Rec. For. Gt. Br., p. 86, pl. vii. 186, 187.  
Generally distributed.

*Miliolina seminulum*, Linné, sp.

*Serpula seminulum*, Linné, 1767, Syst. Nat., 12th ed., p. 1264, No. 791 ; —1788, 13th (Gmelin's) ed., p. 3739, No. 2.

*Miliolina seminulum*, Williamson, 1858, Rec. For. Gt. Br., p. 85, pl. vii. figs. 183-185.

Common on every part of the coast.

*Miliolina venusta*, Karrer, sp.

*Quinqueloculina venusta*, Karrer, 1868, Sitzungsber. d. k. Ak. Wiss. Wien, vol. lvii. p. 147, pl. ii. fig. 6.

*Miliolina venusta*, Robertson, 1882, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 268.

Loch Fyne (Robertson); Estuary of the Dee (Siddall).

*Miliolina auberiana*, d'Orbigny, sp.

*Quinqueloculina auberiana*, d'Orbigny, 1839, Foram. Cuba, p. 167, pl. xii. figs. 1-3.

*Miliolina auberiana*, Robertson, 1882, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 268.

Douglas Bay and Loch Fyne (Robertson); shore-sand, Galway (Balkwill and Millett); south-west of Ireland? (Wright).

*Miliolina sclerotica*, Karrer, sp.

*Quinqueloculina sclerotica*, Karrer, 1868, Sitz. d. k. Akad. Wiss. Wien, vol. lviii. p. 152, pl. iii. fig. 5.

*Miliolina sclerotica*, Balkwill and Millett, 1884, Journ. Micr. and Nat. Sci., vol. iii. p. 24, pl. 1, fig. 2.

Shore-sand, Galway (Balkwill and Millett); Mount's Bay (Millett); generally distributed round the Irish coast (Wright).

*Miliolina contorta*, d'Orbigny, sp.

*Quinqueloculina contorta*, d'Orbigny, 1846, For. Foss. Vien., p. 298, pl. xx. figs. 4-6.



*Miliolina contorta*, Robertson, 1882, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 268.

Loch Fyne (Robertson).

It appears probable that the specimens assigned provisionally by Messrs. Balkwill and Millett to *Miliolina sclerotica*, and those referred by Mr. Robertson to *Miliolina contorta*, belong in reality to the same species. Should that be the case the latter name would take precedence.

*Miliolina labiosa*, d'Orbigny, sp.

*Triloculina labiosa*, d'Orbigny, 1839, Foram. Cuba, p. 157, pl. x. figs. 12-14.

*Miliolina labiosa*, Robertson, 1882, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 268.

Loch Fyne (Robertson).

*Miliolina subrotunda*, Montagu, sp.

*Vermiculum subrotundum*, Montagu, 1803, Test. Brit., pt. 2, p. 521.

*Quinqueloculina subrotunda*, Brady, 1865, Nat. Hist. Trans. Northd. and Durham, vol. i. p. 94, pl. xii. fig. 2.

A very common littoral and shallow-water form.

*Miliolina candeiana*, d'Orbigny, sp.

*Quinqueloculina candeiana*, d'Orbigny, 1839, Foram. Cuba, p. 170, pl. xii. figs. 24-26.

„ „ Brady, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. vi. p. 286, pl. xi. fig. 1.

Brackish water, River Cam (Brady); Estuary of the Dee (Siddall); Mount's Bay (Millett).

*Miliolina secans*, d'Orbigny, sp.

*Quinqueloculina secans*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 303, No. 43;—Modèle, No. 96.

*Miliolina seminulum*, var. *disciformis*, Williamson, 1858, Rec. For. Gt. Br., p. 86, pl. vii. figs. 188, 189.

Generally distributed, but much less common than the last-named species.

*Miliolina tenuis*, Czjzek, sp.

*Quinqueloculina tenuis*, Czjzek, 1847, Haidinger's Naturw. Abhandl., vol. ii. p. 149, pl. xiii. figs. 31-34.

*Miliolina tenuis*, Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 46.

Estuary of the Dee (Siddall); Irish Sea, not uncommon (Balkwill and Wright); Mount's Bay (Millett); south-west of Ireland (Wright); Portree, Skye (Robertson).

The characters of this, and in a less degree of the last-named species, are somewhat ambiguous, and there may be some doubt whether such forms are better placed amongst *Miliolinæ* or *Spiroloculinæ*.

*Miliolina ferussacii*, d'Orbigny, sp.

*Quinqueloculina ferussacii*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 301, No. 18;—Modèle, No. 32.

*Miliolina bicornis*, var. *angulata*, Williamson, 1858, Rec. For. Gt. Br., p. 88, pl. vii. fig. 196.

By no means common, though widely distributed.

*Miliolina bicornis*, Walker and Jacob, sp.

*Serpula bicornis*, Walker and Jacob, 1798, Adams's Essays, Kanmacher's ed., p. 633, pl. xiv. fig. 2.

*Miliolina bicornis*, Williamson, 1858, Rec. For. Gt. Br., p. 87, pl. vii. figs. 190–192.

Not uncommon in shallow dredgings.

*Miliolina boueana*, d'Orbigny, sp.

*Quinqueloculina boueana*, d'Orbigny, 1846, For. Foss. Vien., p. 293, pl. xix. figs. 7–9.

*Miliolina boueana*, Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 51.

If it be needful to recognize by name the comparatively finely striate forms of *Miliolina* which have not retort-shaped segments, as distinct from those that have, *Quinqueloculina boueana* is perhaps the most convenient type to accept; better, I think, than *Triloculina brongniartiana*, d'Orb.

Of their distribution (apart from *M. bicornis*) we have little reliable information.

*Miliolina pulchella*, d'Orbigny, sp.

*Quinqueloculina pulchella*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 303, No. 42;—Soldani, 1798, Testac., vol. ii. p. 53, pl. xviii. fig. *f*.

„ „ Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 466, pl. xlviii. fig. 4.

In dredgings at depths of thirty or forty fathoms or more at various points on the coast; somewhat rare.

*Miliolina fusca*, Brady.

*Quinqueloculina fusca*, Brady, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. vi. p. 286, pl. xi. fig. 2.

Common in estuaries and brackish-water pools.

*Miliolina agglutinans*, d'Orbigny, sp.

*Quinqueloculina agglutinans*, d'Orbigny, 1839, Foram. Cuba, p. 168, pl. xii. figs. 11–13.

„ „ Brady, 1870, Edinburgh Catalogue, p. 2.

The first British specimens assigned to this species were subchitinous forms from brackish water, subsequently described under a distinct name,



*Quinqueloculina fusca*. Somewhat later, however, the typical *M. agglutinans* was found in dredgings from the Hebrides, and it has since been obtained on the Atlantic shores of Ireland by Mr. Wright, and in the Estuary of the Dee by Mr. Siddall.

*Miliolina spiculifera*, Siddall.

*Miliolina spiculifera*, Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 51, pl. i. fig. 3.

“A single example only from the Estuary of the Dee” (Siddall).

Sub-family 3. Hauerininæ.

OPHTHALMIDIUM, Kübler.

*Ophthalmidium inconstans*, Brady.

*Hauerina inconstans*, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 54.

*Ophthalmidium inconstans*, Id. 1884, Challenger Report, p. 189, pl. xii. figs. 5, 7, 8.

„ *carinatum*, Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science), p. 326, pl. xii. figs. 13-16.

The specimens figured by Messrs. Balkwill and Wright, under the name *O. carinatum*, do not appear to me to differ in any important particular from *O. inconstans*. It is true they are much smaller than even the small examples of the latter species obtained from oceanic dredgings, but this is sufficiently accounted for by depth and local conditions. Obtained also by Mr. Wright on the south-west of Ireland, 26 fathoms; and by Mr. Siddall in the Estuary of the Dee.

PLANISPIRINA, Seguenza.

*Planispirina contraria*, d'Orbigny, sp.

*Biloculina contraria*, d'Orbigny, 1846, For. Foss. Vien., p. 266, pl. xvi. figs. 4-6.

„ „ Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 466, pl. xlviii. fig. 2.

Very rare; occurs in dredgings off Shetland, 40 to 100 fathoms; and in Loch Scavaig, 45 to 60 fathoms (Brady); also on the south-west of Ireland (Brady, Wright).

*Planispirina celata*, Costa, sp.

*Spiroloculina celata*, Costa, 1855, Mem. Accad. Napoli, vol. ii. p. 126, pl. i. fig. 14;—1856, Atti dell' Accad. Pont., vol. vii. pl. xxvi. fig. 5.

*Planispirina celata*, Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. p. 608.

Loch Scavaig, 45 to 60 fathoms (Brady); Portree Bay, Skye (Robertson); south-west of Ireland, 48 to 120 fathoms (Wright).

Sub-family 4. **Peneroplidinæ.**

**CORNUSPIRA, Schultze.**

*Cornuspira foliacea*, Philippi, sp.

*Orbis foliaceus*, Philippi, 1844, Enum. Moll. Sicil., vol. ii. p. 147, pl. xxiv. fig. 26.

*Spirillina foliacea*, Williamson, 1858, Rec. For. Gt. Brit., p. 91, pl. vii. figs. 199–201.

Generally distributed.

*Cornuspira involvens*, Reuss.

*Operculina involvens*, Reuss, 1849, Denkschr. d. k. Akad. Wiss. Wien, vol. i. p. 370, pl. xlv. fig. 20.

*Cornuspira involvens*, Siddall, 1876, Ann. and Mag. Nat. Hist., ser. 4, vol. xvii. p. 42.

Comparatively common; occurs in shallower water than its congener *C. foliacea*, preferring muddy bottoms.

*Cornuspira carinata*, Costa, sp.

*Operculina carinata*, Costa, 1856, Atti dell' Accad. Pont., vol. vii. p. 209, pl. xvii. fig. 15.

*Cornuspira carinata*, Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. p. 608.

South-west of Ireland, 79 to 120 fathoms, rare (Wright).

Family III. **ASTRORHIZIDÆ.**

Sub-family 1. **Astrorhizinæ.**

**ASTRORHIZA, Sandahl.**

*Astrorhiza limicola*, Sandahl.

*Astrorhiza limicola*, Sandahl, 1857, Ofvers. af Kongl. Vetenskaps-Akad. Förhandl., vol. xiv. p. 299, pl. iii. figs. 5, 6.

„ „ Brady, 1879, in Siddall's Cat. Brit. Rec. For., p. 10.

At various points on the English and Scotch coast, at depths of 10 to 70 fathoms.

**PELOSINA, Brady.**

*Pelosina variabilis*, Brady.

*Pelosina variabilis*, Brady, 1879, Quart. Journ. Mier. Sci., vol. xix. N.S. p. 30, pl. iii. figs. 1–3.

„ „ Robertson, 1881, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 163.

Cumbræ, Frith of Clyde (Robertson).

**DENDROPHRYA, Str. Wright.**

*Dendrophrya radiata*, Str. Wright.

*Dendrophrya radiata*, Wright, 1861, Ann. and Mag. Nat. Hist., ser. 3, vol. viii. p. 122.



*Dendrophrya radiata*, Brady, 1884, Challenger Report, p. 238, pl. xxvii A. figs. 10-12.

Old Granton Quarries, near Edinburgh (Str. Wright); low-tide pools, Cumbrae, Firth of Clyde (Robertson); "quite common along the N. Wales coast" (Siddall).

*Dendrophrya erecta*, Str. Wright.

*Dendrophrya erecta*, Wright, 1861, Ann. and Mag. Nat. Hist., ser. 3, vol. viii. p. 122, pl. iv. figs. 4, 5.

" " Brady, 1884, Challenger Report, p. 239, pl. xxvii A., figs. 7-9.

Distribution the same as that of the last-named species, from which, indeed, it seems scarcely separable.

Sub-family 2. **Pilulininæ.**

**TECHNITELLA**, Norman.

*Technitella melo*, Norman.

*Technitella melo*, Norman, 1878, Ann. and Mag. Nat. Hist., ser. 5, vol. i. p. 280, pl. xvi. figs. 5, 6.

" " Robertson, 1881, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 107.

Dredged off Oban (Robertson).

*Technitella legumen*, Norman.

*Technitella legumen*, Norman, 1878, Ann. and Mag. Nat. Hist., ser. 5, vol. i. p. 279, pl. xvi. figs. 3, 4.

" " Brady, 1884, Challenger Report, p. 246, pl. xxv. figs. 8-12.

Off Cumbrae, 60 to 65 fathoms; Loch Fyne, 160 fathoms (Robertson); off Isle of Man, 75 fathoms (Elcock); estuary of the Dee (Siddall); Irish Sea (Balkwill and Wright); south-west of Ireland, 112 fathoms (Norman).

**BATHYSIPHON**, Sars.

*Bathysiphon filiformis*, Sars.

*Bathysiphon filiformis* (M. Sars, MS.), G. O. Sars, 1871, Vidensk.-Selsk. Forhandl., 1871, p. 251.

" " Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. p. 608.

South-west of Ireland, 79 fathoms and 110 fathoms (Wright).

Careful examination of Mr. Wright's specimens leaves me in considerable doubt whether they belong to this species or indeed to this genus. They are exceedingly minute, and appear to be made of sponge spicules, but the test is relatively thinner and firmer than I should expect to find in the *Pilulininæ*.

Sub-family 3. **Saccammininæ.**

PSAMMOSPHERA, Schulze.

*Psammosphæra fusca*, Schulze.

*Psammosphæra fusca*, Schulze, 1874, II. Jahresberichte d. Komm. Unters. d. deutsch. Meere in Kiel, p. 113, pl. ii. fig. 8.

„ „ Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 27, pl. iv. figs. 1, 2.

Loch Scavaig, 45 to 60 fathoms (Brady); Portree Bay, Skye; off Cumbrae, 60 fathoms (Robertson); Lambay Deep (Balkwill and Wright); south-west of Ireland, 48 to 110 fathoms (Wright); doubtful specimens from the estuary of the Dee (Siddall).

Sub-family 4. **Rhabdammininæ.**

JACULELLA, Brady.

*Jaculella acuta*, Brady.

*Jaculella acuta*, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 35, pl. iii. figs. 12, 13.

„ „ Siddall, 1879, Cat. Brit. Rec. Foram., p. 4.

St. Magnus Bay, Shetland, 60 fathoms (Norman); off Cumbrae, 60 fathoms (Robertson); off Belfast Lough, 50 to 60 fathoms (Wright).

HYPERAMMINA, Brady.

*Hyperammina elongata*, Brady.

*Hyperammina elongata* (pars), Brady, 1878, Ann. and Mag. Nat. Hist., ser. 5, vol. i. p. 433, pl. xx. fig. 2.

„ „ Robertson, 1880–81, Proc. Nat. Hist. Soc. Glasgow, vol. v. pp. 12, 163.

Off Cumbrae, and off Portree Harbour, dredged (Robertson); estuary of the Dee, very rare (Siddall); Lambay, 45 to 50 fathoms, abundant; and at a few other places in the Irish Sea (Balkwill and Wright); between Belfast Lough and Portpatrick, 100 fathoms, and south-west of Ireland, 79 to 110 fathoms (Wright).

*Hyperammina arborescens*, Norman, sp.

*Psammotodendron arborescens* (Norman MS.), Brady, 1881, Denkschr. d. k. Akad. Wiss. Wien, vol. xliii. p. 98, No. 13;—Ann. and Mag. Nat. Hist., ser. 5, vol. viii. p. 404.

*Hyperammina arbuscula*, Robertson, 1881, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 163.

„ „ *arborescens*, Brady, 1884, Challenger Report, p. 262, pl. xxviii. figs. 12, 13, woodcut, fig. 10.

Dredged between Cumbrae and Bute, 50 fathoms; very common in the Frith of Clyde from 20 to 70 fathoms (Robertson); between Belfast Lough and Portpatrick, 30 to 60 fathoms (Wright).



## HALIPHYSEMA, Bowerbank.

*Haliphysema tumanowiczii*, Bowerbank.

*Haliphysema tumanowiczii*, Bowerbank, 1862, Phil. Trans., p. 1105, pl. lxxiii. fig. 3.

*Squamulina scopula*, Carter, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. v. p. 310, pl. iv.

Off Hastings (Tumanowicz); Berwick Bay (Johnstone); Cullercoats? (Alder); Torbay (Parfitt); Budleigh Salterton (Carter); Mount's Bay (Millett); Colwyn Bay (Siddall); Dublin Bay (Haddon); Jersey (Kent).

*Haliphysema ramulosum*, Bowerbank.

*Haliphysema ramulosa*, Bowerbank, 1864–1866, Monogr. Brit. Spong., vol. ii. p. 79;—vol. iii. pl. xiii. fig. 1.

*Squamulina scopula*, "branched variety," Carter, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. vi. p. 345.

Budleigh Salterton, between tides (Carter); Roundstone Bay, Ireland, on seaweed in shallow water; Guernsey, 15 fathoms (Norman); Cumbrae, low-water, rare (Robertson).

## Family IV. LITUOLIDÆ.

## Sub-family 1. Lituolinæ.

## REOPHAX, Montfort.

*Reophax difflugiformis*, Brady.

*Reophax difflugiformis*, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S., p. 51, pl. iv. fig. 3 *a b*.

" " Robertson, 1880, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 12.

Portree Bay, Skye, 14 to 18 fathoms (Robertson); Mount's Bay, Cornwall (Millett).

*Reophax fusiformis*, Williamson, sp.

*Proteonina fusiformis*, Williamson, 1858, Rec. For. Gt. Br., p. 1, pl. i. fig. 1.

Spread over a wide area, especially abundant on the west coast of Scotland.

*Reophax scorpiurus*, Montfort.

*Reophax scorpiurus*, Montfort, 1808, Conchyl. Systém., vol. i. p. 330, 83<sup>e</sup> genre.

*Lituola scorpiurus*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 467, pl. xlvi. fig. 5.

In dredged material from almost all parts of the coast.

*Reophax nodulosa*, Brady.

*Reophax nodulosa*, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 52, pl. iv. figs. 7, 8.

*Reophaex nodulosa*, Robertson, 1880, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 12.

Frith of Clyde, and Portree Bay, Skye, 14 to 18 fathoms (Robertson); estuary of the Dee (Siddall).

*Reophaex findens*, Parker, sp.

*Lituola findens*, Parker, 1870 (in Dawson's paper), Canad. Nat., vol. v. N.S. p. 177; p. 180, fig. 1.

„ „ Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 47.

*Reophaex moniliforme*, Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 54, pl. i. fig. 2.

Estuary of the Dee (Siddall).

Considerable uncertainty appears to attend this somewhat anomalous species. Moniliform specimens, nearly always fragmentary, but as far as they go corresponding closely with Dr. G. M. Dawson's figures, are not uncommon in shallow dredgings from many parts of our coast. Some of these were supposed at first to be broken specimens of *Bigenerina digitata*, and were described as such by myself; but this explanation is now quite untenable. Mr. Wright's suggestion that they are portions of a sessile organism has much in its favour.

In places where *Reophaex findens* abounds, as in Gaspé Bay, simple as well as branched examples are met with. Dr. Dawson, *loc. cit.*, gives three figures; the first of which represents a single moniliform series of segments, the second a specimen bifid for about half its length, whilst the third is trifid. So far as can be judged from Mr. Siddall's drawing there seem to be no characters by which his *Reophaex moniliforme* can be distinguished from the first of these.

#### HAPLOPHRAGMIUM, REUSS.

*Haplophragmium pseudospirale*, Williamson, sp.

*Proteonina pseudospiralis*, Williamson, 1858, Rec. For. Gt. Brit., p. 2, pl. i. figs. 2, 3.

*Haplophragmium pseudospirale*, Siddall, 1879, Cat. Brit. Rec. For., p. 4.

Common on the west coast of Scotland at 30 to 60 fathoms, also on the west and south-west of Ireland, 90 to 370 fathoms. Balkwill and Wright record its occurrence at Lambay, 45 to 50 fathoms, and at two points in the Irish Sea.

*Haplophragmium agglutinans*, d'Orbigny, sp.

*Spirolina agglutinans*, d'Orbigny, 1846, For. Foss. Vien., p. 137, pl. vii. figs. 10-12.

*Haplophragmium agglutinans*, Brady, 1884, Challenger Report, p. 301, pl. xxxii. figs. 19-26.

Isle of Wight, littoral (Millett); East Solent, 8 fathoms (Brady); Irish Sea, 17 fathoms and 50 fathoms (Balkwill and Wright).

*Haplophragmium canariense*, d'Orbigny, sp.

*Nonionina canariensis*, d'Orbigny, 1839, Foram. Canaries, p. 128, pl. ii. figs. 33, 34.



*Nonionina jeffreysii*, Williamson, 1858, Rec. For. Gt. Br., p. 34, pl. iii. figs. 72, 73.

Common on muddy bottom all round the coast.

*Haplophragmium globigeriniforme*, Parker and Jones, sp.

*Lituola nautiloidea*, var. *globigeriniformis*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 407, pl. xv. figs. 46, 47, &c.

„ *globigeriniformis*, Wright, 1877, Proc. Belfast Nat. Field Club, 1876–77, Appendix, p. 103.

Various points on the Irish coast (Wright); Estuary of the Dee (Siddall).

*Haplophragmium glomeratum*, Brady.

*Lituola glomerata*, Brady, 1878, Ann. and Mag. Nat. Hist., ser. 5, vol. i. p. 433, pl. xx. fig. 1.

*Haplophragmium glomeratum*, Robertson, 1880, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 12.

This is probably not an uncommon form on muddy bottoms, but may be easily overlooked by reason of its minute size and inconspicuous characters. As a British species it was first noticed by Mr. Robertson in Portree Bay, Skye; subsequently by Mr. Wright in Killybegs Harbour, Donegal; and by Messrs. Balkwill and Wright at several points in the Irish Sea.

PLACOPSILINA, d'Orbigny.

*Placopsilina cenomana*, d'Orbigny.

*Placopsilina cenomana*, d'Orbigny, 1850, Prodr. Paléont., vol. ii. p. 185, No. 758.

„ „ Wright, 1886, Proc. Belfast Nat. Field Club, 1885–6, Appendix, p. 320, pl. xxvi. fig. 3.

Rockport, between tides (Malcomson); south-west of Ireland, 110 and 120 fathoms (Wright); Cumbrae, low-water (Robertson).

*Placopsilina bulla*, Brady.

*Placopsilina bulla*, Brady, 1881, Quart. Journ. Micr. Sci., vol. xxi. N.S. p. 51.

„ „ Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 54.

Doubtful specimens from the estuary of the Dee (Siddall).

*Placopsilina varians*, Carter, sp.

*Squamulina varians*, Carter, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. v. p. 321, pl. v. figs. 1–5.

*Placopsilina kingsleyi*, Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 54, pl. i. fig. 1.

I am not prepared to say what is the precise position and relationship of this organism; but I believe Mr. Siddall's specimens to belong to the species described many years ago by Mr. Carter under the name *Squamulina varians*, and treated by him as a near ally of *Haliphysema*

*tumanowiczii*, with which it is often found associated. Mr. Carter's specimens were from Budleigh Salterton; Mr. Siddall's from the estuary of the Dee.

Sub-family 2. Trochammininæ.

THURAMMINA, Brady.

*Thurammia papillata*, Brady.

*Thurammia papillata*, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 45, pl. v. figs. 4-8.

„ „ Id. 1884, Challenger Report, p. 321, pl. xxxvi. figs. 7-18.

Loch Scavaig, 45 to 60 fathoms (Brady); south-west of Ireland, 38 to 110 fathoms (Wright).

AMMODISCUS, Reuss.

*Ammodiscus incertus*, d'Orbigny, sp.

*Operculina incerta*, d'Orbigny, 1839, Foram. Cuba, p. 71, pl. vi. figs. 16, 17.

*Spirillina arenacea*, Williamson, 1858, Rec. For. Gt. Br., p. 93, pl. vii. fig. 203.

Sparsely scattered all round the coast.

*Ammodiscus gordialis*, Jones and Parker, sp.

*Trochammia squamata gordialis*, Jones and Parker, 1860, Quart. Journ. Geol. Soc., vol. xvi. p. 304.

„ „ *gordialis*, Robertson, 1874, Trans. Geol. Soc. Glasgow, vol. v. pt. 1, p. 143.

Found with *A. incertus*, but comparatively rare.

*Ammodiscus charoides*, Jones and Parker, sp.

*Trochammia squamata charoides*, Jones and Parker, 1860, Quart. Journ. Geol. Soc., vol. xvi. p. 304.

„ „ *charoides*, Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 47.

Estuary of the Dee (Siddall); Irish Sea (Balkwill and Wright); south-west of Ireland (Wright); Loch Fyne, 105 fathoms (Robertson).

*Ammodiscus shoneanus*, Siddall.

*Trochammia shoneana*, Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 46, woodcuts 1, 2.

Estuary of the Dee (Siddall); Rockport, Belfast Lough (Malcomson); off Dublin (Wright); Cumbrae, and Loch Fyne (Robertson).

TROCHAMMINA, Parker and Jones.

*Trochammia squamata*, Jones and Parker.

*Trochammia squamata*, Jones and Parker, 1860, Quart. Journ. Geol. Soc., vol. xvi. p. 304.



*Trochammia squamata*, Brady, 1884, Challenger Report, p. 337, pl. xli. fig. 3.

Concerning the distribution of this form, as distinct from *Trochammia ochracea* on the one hand and *Valvulina fusca* on the other, we have but little reliable information.

*Trochammia ochracea*, Williamson, sp.

*Rotalina ochracea*, Williamson, 1858, Rec. For. Gt. Br., p. 55, pl. iv. fig. 112, pl. v. fig. 113.

*Discorbina turbo*, var. *ochracea*, Parker and Jones, 1862, Carpenter's Introd. Foram., Appendix, p. 311.

Shetland (Williamson); shore-sand Galway (Balkwill and Millett); Mount's Bay (Millett); generally distributed round the Irish coast, but the number of specimens small (Wright).

*Trochammia plicata*, Terquem, sp.

*Patellina plicata*, Terquem, 1876, Anim. sur la Plage de Dunkerque, 2<sup>me</sup> fasc., p. 72, pl. viii. fig. 9.

*Trochammia plicata*, Balkwill and Millett, 1884, Journ. Microsc. and Nat. Sci., vol. iii. p. 26, pl. ii. fig. 8.

Shore-sand Galway (Balkwill and Millett); Mount's Bay, Cornwall (Millett).

*Trochammia inflata*, Montagu, sp.

*Nautilus inflatus*, Montagu, 1808, Test. Brit., Suppl., p. 81, pl. xviii. fig. 3.

*Rotalina inflata*, Williamson, 1858, Rec. For. Gt. Br., p. 50, pl. iv. figs. 93, 94.

Rarely met with except in brackish water.

*Trochammia inflata*, var. *macrescens*, Brady.

*Trochammia inflata*, var. *macrescens*, Brady, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. vi. p. 290, pl. xi. fig. 5.

In brackish pools.

I have great doubt as to the propriety of retaining this form under a distinct name. The examination of a considerable series of specimens suggests that it represents only the depauperated condition of *Trochammia inflata*;—in other words, that when *Trochammia inflata* lives in pools, the water of which contains a very small proportion of mineral constituents, the test loses its firm shelly consistence and becomes little more than a chitinous envelope, so thin that the inflated contour of the segments is lost when the specimens are taken out of fluid and dried.

*Trochammia nitida*, Brady.

*Trochammia nitida*, Brady, 1881, Quart. Journ. Micr. Sci., vol. xxi. N.S. p. 52; 1884, Challenger Report, p. 339, pl. xli. figs. 5, 6.

*Trochammina nitida*, Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science), p. 609.

South-west of Ireland, 40 to 110 fathoms, rather rare (Wright); estuary of the Dee, rather rare (Siddall).

*Trochammina trullissata*, Brady.

*Trochammina trullissata*, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 56, pl. v. figs. 10, 11.

„ „ Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science) p. 609.

South-west of Ireland, 54 to 110 fathoms (Wright).

*Trochammina robertsoni*, n. sp.

Test free, planospiral, involute; discoidal, or compressed, nearly symmetrical bilaterally, more or less excavated at the umbilicus; peripheral edge rounded, lobulate; each convolution completely or almost completely enclosing that preceding it; segments somewhat inflated, usually five (four to six) in the outermost whorl: colour rich light brown, texture very finely arenaceous, surface polished. Diameter about  $\frac{1}{100}$ th inch (0·25 millim.).

This prettily little *Trochammina* has long been familiar to those who have been in the habit of examining dredged material from the west coast of Scotland. I have before me drawings made nearly twenty years ago from Hebrides specimens, and it has since been repeatedly brought under my notice by the Rev. Dr. Norman and Mr. Robertson. It is very distinct from any of its congeners, and I have ventured to associate with it the name of my indefatigable friend who has done so much to elucidate the marine invertebrata of the Clyde region. The species is not uncommon in deepish water on the west of Scotland, and it occurs also in Mr. Wright's dredgings from the south-west of Ireland. I have placed a mounting of it, under its present name, in the British collection at the British Museum.

WEBBINA, d'Orbigny.

*Webbina hemisphærica*, Jones, Parker, and Brady.

*Webbina hemisphærica*, Jones, Parker, and Brady, 1866, Monogr. Crag Foram., p. 27, pl. iv. fig. 5.

„ „ Robertson, 1875, Report Brit. Ass., Bristol Meeting, p. 189.

Coast of Durham, 25 to 33 fathoms (Robertson).

*Webbina clavata*, Jones and Parker.

*Trochammina irregularis clavata*, Jones and Parker, 1860, Quart. Journ. Geol. Soc., vol. xvi. p. 304.

*Webbina clavata*, Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science), p. 609.

South-west of Ireland, rare at 100 and 120 fathoms (Wright).  
1887.



Family V. **TEXTULARIDÆ.**Sub-family 1. **Textularinæ.****TEXTULARIA**, DeFrance.*Textularia sagittula*, DeFrance.

*Textularia sagittula*, DeFrance, 1824, Dict. Sci. Nat., vol. xxxii. p. 177; vol. liii. p. 344;—Atlas Conch., pl. xiii. fig. 5.

„ *cuneiformis* (*typica*)? Williamson, 1858, Rec. For. Gt. Br., p. 75, pl. vi. figs. 158, 159.

A common littoral and shallow-water form.

*Textularia trochus*, d'Orbigny.

*Textularia trochus*, d'Orbigny, 1840, Mem. Soc. Géol. France, vol. iv. p. 45, pl. iv. figs. 25, 26.

„ *cuneiformis*, var. *conica*, Williamson, 1858, Rec. For. Gt. Br., p. 75, pl. vi. figs. 160, 161.

Common.

*Textularia agglutinans*, d'Orbigny.

*Textularia agglutinans*, d'Orbigny, 1839, Foram. Cuba, p. 136, pl. i. figs. 17, 18, 32–34.

„ „ Siddall, 1879, Catal. Brit. Rec. Foram., p. 8.

Generally distributed.

*Textularia agglutinans*, var. *porrecta*, Brady.

*Textularia agglutinans*, var. *porrecta*, Brady, 1884, Challenger Report, p. 364, pl. liii. fig. 4.

„ „ „ Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 65.

Mr. Siddall reports this variety from the estuary of the Dee.

*Textularia gramen*, d'Orbigny.

*Textularia gramen*, d'Orbigny, 1846, For. Foss. Vien., p. 248, pl. xv. figs. 4–6.

„ „ Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science) p. 332, pl. xiii. figs. 13, 14.

Frequent in the Irish Sea (Balkwill and Wright); and off south-west of Ireland (Wright); shore-sand, Galway (Balkwill and Millett); Mount's Bay, Cornwall (Millett).

*Textularia concava*, Karrer, sp.

*Plecanium concavum*, Karrer, 1868, Sitzungsab. d. k. Akad. Wiss. Wien, vol. lviii. p. 129, pl. i. fig. 3.

*Textularia concava*, Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science) p. 609.

South-west of Ireland; 40 fathoms, downwards; abundant at 79 fathoms and 110 fathoms (Wright).

*Textularia globulosa*, Ehrenberg.

*Textularia globulosa*, Ehrenberg, 1839, Abhandl. Akad. Berlin (1838)  
p. 135, No. 60, pl. iv. several figures.

„ „ Brady, 1870, Ann. and Mag. Nat. Hist., ser. 4,  
vol. vi. p. 300, pl. xii. fig. 4.

Westport, brackish water (Brady); off Dublin (Balkwill and Wright).

*Textularia variabilis*, Williamson.

*Textularia variabilis (typica)*, Williamson, 1858, Rec. For. Gt. Brit.,  
p. 76, pl. vi. figs. 162, 163.

Widely distributed.

Probably this, like many other of Williamson's *Textulariæ*, will eventually be transferred to the genus *Bolivina*.

BIGENERINA, d'Orbigny.

*Bigenerina digitata*, d'Orbigny.

*Bigenerina (Gemmulina) digitata*, d'Orbigny, 1826, Ann. Sci. Nat.,  
vol. vii. p. 262, No. 4;—Modèle, No. 58.

„ *digitata*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv.  
p. 468, pl. xlviii. fig. 8.

Shetland, Hebrides, estuary of the Dee, and at various points to the west and south-west of Ireland.

*Bigenerina nodosaria*, d'Orbigny.

*Bigenerina nodosaria*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 261,  
No. 1, pl. xi., figs. 9–12;—Modèle, No. 57.

„ „ Waller, 1867, Report Brit. Assoc., Dundee  
Meeting, p. 445.

Shetland (Waller, Brady); south-west of Ireland (Wright).

SPIROPLECTA, Ehrenberg.

*Spiroplecta rosula*, Ehrenberg.

*Spiroplecta rosula*, Ehrenberg, 1854, Mikrogeologie, pl. xxxii, II. fig. 26.

*Textularia complexa*, Brady, 1865, Nat. Hist. Trans. Northd. and  
Durham, vol. i. p. 101, pl. xii. fig. 6.

Northumberland and Durham coast, very rare.

*Spiroplecta biformis*, Parker and Jones, sp.

*Textularia agglutinans*, var. *biformis*, Parker and Jones, 1865, Phil.  
Trans., vol. clv. p. 370, pl. xv. figs. 23, 24.

*Spiroplecta biformis*, Balkwill and Wright, 1885, Trans. R. Irish Acad.,  
vol. xxviii. (Science) p. 333, pl. xiii. fig. 21, and woodcut.

Belfast Lough (Malcomson); Dublin coast (Balkwill and Wright).

GAUDRYINA, d'Orbigny.

*Gaudryina scabra*, Brady.

*Gaudryina pupoides*, Brady, 1870, Ann. and Mag. Nat. Hist., ser. 4,  
vol. vi. p. 300, pl. xii. fig. 5.



*Gaudryina scabra*, Id., 1884, Challenger Report, p. 381, pl. xlvi. fig. 7.

Montrose Basin, very rare.

It may here be mentioned that in Mr. Wright's cabinet there are small specimens of the typical *Gaudryina pupoides*, d'Orb., from 110, 160, and 200 fathoms respectively, on the south-west of Ireland.

*Gaudryina filiformis*, Berthelin.

*Gaudryina filiformis*, Berthelin, 1880, Mém. Soc. géol. France, sér. 3, vol. i. No. 5, p. 25, pl. i. fig. 8.

„ „ Wright, 1882, Proc. Belfast Nat. Field Club (1880-1), Appendix, p. 180, pl. viii. fig. 3, 3 a, b.

Killybegs Harbour, 17 fathoms, and south-west of Ireland (Wright); Dublin coast, rather rare (Balkwill and Wright); Galway (Balkwill and Millett); west of Scotland (Robertson); Mount's Bay, Cornwall (Millett).

VERNEUILINA, d'Orbigny.

*Verneuilina polystropha*, Reuss, sp.

*Bulimina polystropha*, Reuss, 1845, Verstein. Böhm. Kreid., pt. ii. p. 109, pl. xxiv. fig. 53.

„ *scabra*, Williamson, 1858, Rec. For. Gt. Brit., p. 65, pl. v. figs. 136, 137.

„ *arenacea*, Id., Ibid., p. 98.

Generally distributed.

*Verneuilina spinulosa*, Reuss.

*Verneuilina spinulosa*, Reuss, 1849, Denkschr. d. k. Ak. Wiss. Wien, vol. i. p. 374, pl. xlvii. fig. 12.

„ „ Brady, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. vi. p. 301, pl. xii. fig. 6.

Westport, Ireland (Brady); Dublin coast (Balkwill and Wright); estuary of the Dee (Siddall).

VALVULINA, d'Orbigny.

*Valvulina fusca*, Williamson, sp.

*Rotalina fusca*, Williamson, 1858, Rec. For. Gt. Brit., p. 55, pl. v. figs. 114, 115.

*Valvulina triangularis*, var. *austriaca*, Parker and Jones, 1862, Carpenter's Introd. Foram., Appendix, p. 311.

Found on almost all parts of the coast.

*Valvulina conica*, Parker and Jones.

*Valvulina triangularis*, var. *conica*, Parker and Jones, 1865, Phil. Trans. vol. clv. p. 406, pl. xv. fig. 27.

„ *conica*, Brady, 1870, Edinburgh Catalogue, p. 3.

The only British specimens of this species I have seen were from Shetland and the Hebrides, and were doubtfully separable from *V. fusca*. Somewhat further north, and in deeper water, it is not very rare.

Sub-family 2. **Bulimininæ.**

BULIMINA, d'Orbigny.

*Bulimina pupoides*, d'Orbigny.

*Bulimina pupoides*, d'Orbigny, 1846, For. Foss. Vien., p. 185, pl. xi. figs. 11, 12.

„ „ Williamson, 1858, Rec. For. Gt. Brit., p. 62, pl. v. figs. 124, 125.

*Bulimina ovata*, d'Orbigny.

*Bulimina ovata*, d'Orbigny, 1846, For. Foss. Vien., p. 185, pl. xi. figs. 13, 14.

„ „ Brady, 1884, Challenger Report, p. 400, pl. 1. fig. 13.

As I have elsewhere stated (Challenger Report, p. 400), *Bulimina pupoides* and *B. ovata* (and it may be added *B. affinis*) “cannot be separated except by comparative characters too variable to be of any real zoological value.” I see no advantage in referring Williamson's *B. pupoides* var. *fusiformis* to *B. ovata*, as proposed by Parker and Jones; indeed it seems to be a fairly distinct form more nearly allied to *B. pupoides*. *B. ovata* stands about midway between *B. pupoides* and *B. pyrula*.

These *Buliminæ* are common all round the coast. Typical specimens of *B. ovata* are very abundant in some of Mr. Wright's material from the south-west of Ireland.

*Bulimina fusiformis*, Williamson.

*Bulimina pupoides*, var. *fusiformis*, Williamson, 1858, Rec. For. Gt. Br., p. 63, pl. v. figs. 129, 130.

„ *presli*, var. *ovata*, Parker and Jones, 1862, Carpenter's Introd. Foram., Appendix, p. 311.

Generally distributed.

*Bulimina pyrula*, d'Orbigny.

*Bulimina pyrula*, d'Orbigny, 1846, For. Foss. Vien., p. 184, pl. xi. figs. 9, 10.

South-west of Ireland; small specimens, fairly typical, at 40 fathoms, larger examples at 160 and 200 fathoms (Wright).

*Bulimina marginata*, d'Orbigny.

*Bulimina marginata*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 269, No. 4, pl. xii. figs. 10-12.

„ *pupoides*, var. *marginata*, Williamson, 1858, Rec. For. Gt. Br., p. 62, pl. v. figs. 126, 127.

Common.

*Bulimina aculeata*, d'Orbigny.

*Bulimina aculeata*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 269, No. 7;—Soldani, Testaceographia, vol. i. pt. 2, p. 118, pl. cxxvii. fig. I; pl. cxxx. fig. v v.



*Bulimina pupoides*, var. *spinulosa*, Williamson, 1858, Rec. For. Gt. Br., p. 62, pl. v. fig. 128.

Widely distributed but not so common as the last-named species, from which it is often with difficulty separable.

*Bulimina convoluta*, Williamson.

*Bulimina pupoides*, var. *convoluta*, Williamson, 1858, Rec. For. Gt. Br., p. 63, pl. v. figs. 132, 133.

Shetland, Skye (Williamson); an exceedingly rare form.

*Bulimina subteres*, Brady.

*Bulimina prestli*, var. *elegantissima*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 374, pl. xv. figs. 12–17.

„ *subteres*, Brady, 1881, Quart. Journ. Micr. Sci., vol. xxi. N.S. p. 55.

Shetland, west coast of Scotland, Irish Sea, north and west coasts of Ireland, and elsewhere.

*Bulimina elegans*, d'Orbigny.

*Bulimina elegans*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 270, No. 10;—Modèle, No. 9.

„ „ Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 55.

Estuary of the Dee (Siddall); south-west of Ireland (Wright).

*Bulimina elegantissima*, d'Orbigny.

*Bulimina elegantissima*, d'Orbigny, 1839, Foram. Amér. Mérid., p. 51, pl. vii. figs. 13, 14.

„ „ Williamson, 1858, Rec. For. Gt. Brit., p. 64, pl. v. figs. 134, 135.

Sparsely distributed all round the coast.

*Bulimina squamigera*, d'Orbigny.

*Bulimina squamigera*, d'Orbigny, 1839, Foram. Canaries, p. 137, pl. i. figs. 22–24.

„ „ Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 49.

Estuary of the Dee (Siddall).

VIRGULINA, d'Orbigny.

*Virgulina schreibersiana*, Czjzek.

*Virgulina schreibersiana*, Czjzek, 1847, Haidinger's Naturw. Abhandl., vol. ii. p. 147, pl. xiii. figs. 18–21.

*Bulimina pupoides*, var. *compressa*, Williamson, 1858, Rec. For. Gt. Br., p. 63, pl. v. fig. 131.

Generally distributed.

BOLIVINA, d'Orbigny.

*Bolivina punctata*, d'Orbigny.

*Bolivina punctata*, d'Orbigny, 1839, *Foram. Amér. Mérid.*, p. 63, pl. viii. figs. 10–12.

„ „ Brady, 1864, *Trans. Linn. Soc. Lond.*, vol. xxiv. p. 468, pl. xlviii. fig. 9.

Generally distributed.

*Bolivina plicata*, d'Orbigny.

*Bolivina plicata*, d'Orbigny, 1839, *Foram. Amér. Mérid.*, p. 62, pl. viii. figs. 4–7.

„ „ Brady, 1870, *Ann. and Mag. Nat. Hist.*, ser. 4, vol. vi. p. 302, pl. xii. fig. 7.

Found sparingly at a considerable number of localities, often in brackish water.

*Bulimina buchiana*, d'Orbigny.

*Bulimina buchiana*, d'Orbigny, 1846, *For. Foss. Vien.*, p. 186, pl. xi. figs. 15–18.

„ „ Wright, 1886, *Proc. R. Irish Acad.*, ser. 2, vol. iv. (Science) p. 610.

South-west of Ireland, 48 to 120 fathoms (Wright).

*Bolivina costata*, d'Orbigny.

*Bolivina costata*, d'Orbigny, 1839, *Foram. Amér. Mérid.*, p. 62, pl. viii. figs. 8, 9.

„ „ Brady, 1870, *Ann. and Mag. Nat. Hist.*, ser. 4, vol. vi. p. 302.

In shallow-water mud, Eastbourne, Sussex (Parker).

*Bolivina difformis*, Williamson, sp.

*Textularia variabilis*, var. *difformis*, Williamson, 1858, *Rec. For. Gt. Br.*, p. 77, pl. vi. figs. 166, 167.

„ *agglutinans*, var. *difformis*, Parker and Jones, 1862, *Carpenter's Introd. Foram.*, Appendix, p. 311.

*Bolivina pygmæa*, Brady, 1884, *Challenger Report*, p. 421, pl. liii. figs. 5, 6.

This is doubtless, as Messrs. Balkwill and Wright observe, a true *Bolivina*; and if so, the *Bolivina pygmæa* of the 'Challenger' Report may be merged into the same species.

It is a comparatively rare form on the British coast. Williamson gives no localities. It is, however, recorded from Shetland (Brady, Waller); estuary of the Dee (Siddall); Mount's Bay (Millett); Irish Sea (Balkwill and Wright); Galway (Balkwill and Millett); and the south-west of Ireland (Wright).



*Bolivina dilatata*, Reuss.

*Bolivina dilatata*, Reuss, 1849, Denkschr. d. k. Ak. Wiss. Wien, vol. i. p. 381, pl. xlviii. fig. 15.

*Textularia variabilis*, var. *spathulata*, Williamson, 1858, Rec. For. Gt. Br., p. 76, pl. vi. figs. 164, 165.

*Bolivina dilatata*, Robertson, 1880, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 12.

Torquay, Shetland (Williamson); Mount's Bay (Millett); Portree Bay, Skye (Robertson); Irish Sea, very rare (Balkwill and Wright); south-west of Ireland, common (Wright).

*Bolivina lævigata*, Williamson, sp.

*Textularia variabilis*, var. *lævigata*, Williamson, 1858, Rec. For. Gt. Br., p. 77, pl. vi. fig. 168.

*Bolivina textularioides*, Reuss, 1862, Sitzungsab. d. k. Akad. Wiss. Wien, vol. xlvi. p. 81, pl. x. fig. i.

„ „ „ Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science) p. 334.

Off Dublin coast, rare (Balkwill and Wright); Mount's Bay (Millett); south-west of Ireland (Wright); shore-sand, Galway (Balkwill and Millett).

Messrs. Balkwill and Millett are probably correct in associating Williamson's *Textularia variabilis*, var. *lævigata* with Reuss's better known species. The change of name, however, entails a certain amount of inconvenience, as the term "*lævigata*" has been recently used by Karrer for a somewhat different modification of the type.

*Bolivina ænariensis*, Costa, sp.

*Brizalina ænariensis*, Costa, 1856, Atti dell' Accad. Pont., vol. vii. p. 297, pl. xv. fig. 1.

*Bolivina costata*, Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 55.

„ *ænariensis*, Id., 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 56.

Estuary of the Dee (Siddall).

## Sub-family 3. Cassidulininæ.

## CASSIDULINA, d'Orbigny.

*Cassidulina lævigata*, d'Orbigny.

*Cassidulina lævigata*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 282, No. 1, pl. xv. figs. 4, 5;—Modèle, No. 41.

„ „ „ Williamson, 1858, Rec. For. Gt. Br., p. 68, pl. vi. figs. 141, 142.

Rare at depths of less than 30 fathoms or thereabouts, but comparatively common in deeper water off Shetland, the west of Scotland, and the west and south of Ireland.

No good purpose is served by attempting to separate *Cassidulina*

*pulchella*, d'Orbigny, from the typical *C. lævigata*; a few specimens with the sharp peripheral edge becoming slightly carinate are generally met with where the typical form abounds.

*Cassidulina crassa*, d'Orbigny.

*Cassidulina crassa*, d'Orbigny, 1839, *Foram. Amér. Mérid.*, p. 56, pl. vii. figs. 18–20.

„ *obtusa*, Williamson, 1858, *Rec. For. Gt. Br.*, p. 69, pl. vi. figs. 143, 144.

Distribution similar to that of *C. lævigata*, but it appears to frequent somewhat shallower water, and is not unfrequently found under such conditions where its congener is absent.

The *Cassidulina oblonga* of Reuss cannot be separated from this species.

*Cassidulina bradyi*, Norman.

*Cassidulina bradyi* (Norman MS.), Wright, 1880, *Proc. Belfast Nat. Field Club* (1879–80) Appendix, p. 152.

„ „ Brady, 1884, *Challenger Report*, p. 431, pl. liv. figs. 6–10.

South and west of Ireland, 54 to 120 fathoms (Norman, Wright, Brady).

Family VI. **CHILOSTOMELLIDÆ.**

**CHILOSTOMELLA**, Reuss.

*Chilostomella ovoidea*, Reuss.

*Chilostomella ovoidea*, Reuss, 1849, *Denkschr. d. k. Akad. Wiss. Wien*, vol. i. p. 380, pl. xlviii. fig. 12.

„ „ Brady, 1879, *Quart. Journ. Micr. Sci.*, vol. xix. N.S. p. 66, pl. viii. figs. 11, 12.

Off Valentia, 112 fathoms (Norman); south-west of Ireland, 48 to 110 fathoms (Wright).

Family VII. **LAGENIDÆ.**

Sub-family 1. **Lageninæ.**

**LAGENA**, Walker and Boys.

*Lagena globosa*, Montagu, sp.

*Vermiculum globosum*, Montagu, 1803, *Test. Brit.*, p. 523.

*Entosolenia globosa*, Williamson, 1858, *Rec. For. Gt. Br.*, p. 8, pl. i. fig. 15, 16.

Common.

*Lagena lævis*, Montagu, sp.

*Vermiculum læve*, Montagu, 1803, *Test. Brit.*, p. 524.

*Lagena vulgaris*, Williamson, 1858, *Rec. For. Gt. Br.*, p. 4, pl. i. figs. 5, 5a.

Common.



*Lagena clavata*, d'Orbigny, sp.

*Oolina clavata*, d'Orbigny, 1846, For. Foss. Vien., p. 24, pl. i. figs. 2, 3.

*Lagena vulgaris*, var. *clavata*, Williamson, 1858, Rec. For. Gt. Br., p. 5, pl. i. fig. 6.

The fusiform, pointed variety of *L. lævis*, and probably equally common.

*Lagena gracillima*, Seguenza, sp.

*Amphorina gracillima*, Seguenza, 1862, Foram. Monotal. Mess., p. 51, pl. i. fig. 37.

*Lagena gracillima*, Brady, 1870, Edinburgh Catalogue, p. 4.

Not unfrequent on muddy bottoms.

*Lagena aspera*, Reuss.

*Lagena aspera*, Reuss, 1861, Sitzungsab. d. k. Ak. Wiss. Wien, vol. xlv. p. 305, pl. i. fig. 5.

„ „ Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 48.

Estuary of the Dee (Siddall); Dublin coast and Irish Sea (Balkwill and Wright); Galway (Balkwill and Millett); Killybegs Harbour (Wright).

*Lagena hispida*, Reuss.

*Lagena hispida*, Reuss, 1858, Zeitschr. d. deutsch. geol. Gesell., vol. x. p. 434.

„ *jeffreysii*, Brady, 1866, Report Brit. Assoc., Nottingham Meeting,—Trans. p. 70.

West of Scotland, and various points on the coast of Ireland, rare; estuary of the Dee, rare.

*Lagena jeffreysii* appears to have no distinctive characters sufficiently constant to entitle it to separate treatment.

*Lagena lineata*, Williamson, sp.

*Entosolenia globosa*, var. *lineata*, Williamson, 1858, Rec. For. Gt. Br., p. 9, pl. i. fig. 17.

*Lagena caudata*, Parker and Jones, 1862, Carpenter's Introd. Foram., Appendix, p. 309.

Widely distributed.

*Lagena distoma*, Parker and Jones.

*Lagena distoma*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 467, pl. xlviii. fig. 6.

*Lagena sulcata*, var. *distoma*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 356, pl. xiii. fig. 20.

Found sparingly all round the coast.

*Lagena curvilineata*, Balkwill and Wright.

*Lagena curvilineata*, Balkwill and Wright, 1885, Trans. R. Irish. Acad., vol. xxviii. (Science) p. 338, pl. xiv. figs. 21–24.

Irish Sea (Balkwill and Wright); shore-sand, Galway (Balkwill and Millett); Loch Fyne (Robertson); Mount's Bay (Millett).

*Lagena sulcata*, Walker and Jacob, sp.

*Serpula (Lagena) sulcata*, Walker and Jacob, 1798, Adams's Essays, Kanmacher's ed., p. 634, pl. xiv. fig. 5.

*Lagena vulgaris*, var. *perlucida* (pars), Williamson, 1885, Rec. For. Gt. Br., p. 5, pl. i. fig. 8.

„ „ var. *striata*, Id. Ibid., p. 6. pl. i. fig. 10.

„ „ var. *interrupta*, Id. Ibid., p. 7, pl. i. fig. 11.

Common.

The apiculate forms of *Lagena sulcata* and *L. costata* constitute the *Amphorina lyellii* and *A. costata* of Seguenza; and it is probable, as suggested by the Rev. Dr. Norman, that portions of *Nodosaria scalaris*, var. *separans* have also been assigned to this group.

*Lagena williamsoni*, Alcock, sp.

*Entosolenia williamsoni*, Alcock, 1865, Proc. Lit. and Phil. Soc. Manchester, vol. iv. p. 195.

*Lagena williamsoni*, Wright, 1877, Proc. Belfast Nat. Field Club, 1876-77, Appendix, p. 104, pl. iv. fig. 14.

Common.

*Lagena costata*, Williamson, sp.

*Entosolenia costata*, Williamson, 1858, Rec. For. Gt. Br., p. 9, pl. i. fig. 18.

*Lagena costata*, Wright, 1877, Proc. Belfast Nat. Field Club, 1876-77, Appendix, p. 103, pl. iv. figs. 11-13.

Not uncommon in dredgings from moderate depths.

*Lagena striata*, d'Orbigny, sp.

*Oolina striata*, d'Orbigny, 1839, Foram. Amér. Mérid., p. 21, pl. v. fig. 12.

*Lagena vulgaris*, var. *substriata*, Williamson, 1858, Rec. For. Gt. Br., p. 7, pl. i. fig. 14.

Common.

*Lagena gracilis*, Williamson.

*Lagena gracilis*, Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 13, pl. i. fig. 5.

„ *vulgaris*, var. *gracilis*, Id. 1858, Rec. For. Gt. Br., p. 7, pl. i. figs. 12, 13.

Generally distributed, though scarcely so common as *L. striata*.

*Lagena semistriata*, Williamson.

*Lagena striata*, var. *semistriata*, Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 14, pl. i. figs. 9, 10.

„ *vulgaris*, var. *semistriata*, Id. 1858, Rec. For. Gt. Br., p. 6, pl. i. fig. 9.

Common.



*Lagena striatopunctata*, Parker and Jones.

*Lagena sulcata*, var. *striatopunctata*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 350, pl. xiii. figs. 25–27.

„ *striatopunctata*, Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 53.

Estuary of the Dee (Siddall); Irish Sea (Balkwill and Wright); Strangford Lough (Wright).

*Lagena feildeniana*, Brady.

*Lagena feildeniana*, Brady, 1878, Ann. and Mag. Nat. Hist., ser. 5, vol. i. p. 434, pl. xx. fig. 4.

„ „ Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science) p. 339, pl. xiv. fig. 19.

Irish Sea (Balkwill and Wright); estuary of the Dee (Siddall).

*Lagena crenata*, Parker and Jones.

*Lagena crenata*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 420, pl. xviii. fig. 4.

„ „ Brady, 1866, Report Brit. Assoc., Nottingham Meeting, Trans., p. 70.

Dog's Bay, Connemara (Alcock); Hebrides (Brady); Shetland (Waller); Dublin Bay (Balkwill and Wright); south-west of Ireland (Wright).

*Lagena squamosa*, Montagu, sp.

*Vermiculum squamosum*, Montagu, 1803, Test. Brit., p. 526, pl. xiv. fig. 2.

*Entosolenia squamosa* Williamson, 1858, Rec. For. Gt. Br., p. 12, pl. i. fig. 29.

Common.

*Lagena hexagona*, Williamson, sp.

*Entosolenia squamosa*, var. *hexagona*, Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 20, pl. ii. fig. 23.

„ „ „ Id., 1858, Rec. For. Gt. Br., p. 13, pl. i. fig. 32.

„ „ var. *scalariformis*, Id., Ibid., p. 13, pl. i. fig. 30.  
Common.

*Lagena melo*, d'Orbigny, sp.

*Oolina melo*, d'Orbigny, 1839, Foram. Amér. Mérid., p. 20, pl. v. fig. 9.

*Entosolenia squamosa*, var. *catenulata*, Williamson, 1858, Rec. For. Gt. Br., p. 13, pl. i. fig. 31.

Probably widely distributed, but characteristic specimens are certainly less common than the allied reticulate forms.

*Lagena lævigata*, Reuss, sp.

*Fissurina lævigata*, Reuss, 1849, Denkschr. d. k. Akad. Wiss. Wien, vol. i. p. 366, pl. xlvi. fig. 1.

*Lagena lævigata*, Robertson, 1883, Trans. Geol. Soc. Glasgow, vol. vii. p. 24.

Common.

Trifacial specimens of this species have been named by Seguenza *Trigonulina oblonga*, by Siddall *Lagena trigono-oblonga*, and by Balkwill and Millett *Lagena trigono-lævigata*. Such examples are rare, but are occasionally met with when the typical form is plentiful.

*Lagena faba*, Balkwill and Millett.

*Lagena faba*, Balkwill and Millett, 1884, Journ. Micr. and Nat. Sci., vol. iii. p. 81, pl. ii. fig. 10.

Galway (Balkwill and Millett).

The authors above quoted describe trifacial specimens of the same variety under the name *Lagena trigono-faba*.

A very similar form to the *Fissurina aperta* of Seguenza, the latter being slightly carinate. I greatly doubt the wisdom of attempting to separate such specimens from *Lagena lævigata* and *L. marginata*.

*Lagena marginata*, Walker and Boys.

*Serpula (Lagena) marginata*, Walker and Boys, 1784, Test. Min., p. 2, pl. i. fig. 7.

*Entosolenia marginata* (pars), Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i. p. 17, pl. ii. figs. 15, 16.

„ „ (pars), Id., 1858, Rec. For. Gt. Br., p. 10, pl. i. fig. 21.

Common.

Trifacial specimens are described under the name *Trigonulina globosa* by Seguenza, and as *Lagena trigono-elliptica* by Balkwill and Millett. The mucronate form is the *Fissurina pedunculata* of Seguenza, and the *Lagena marginata*, var. *pedunculata* of Balkwill and Millett.

*Lagena lucida*, Williamson, sp.

*Entosolenia marginata*, var. *lucida*, Williamson, 1858, Rec. For. Gt. Br., p. 10, pl. i. figs. 22, 23.

Not uncommon.

A variety of *L. lævigata*, broadest near the base. Apiculate specimens of the same form constitute the *Fissurina acuta* of Reuss.

*Lagena quadrata*, Williamson, sp.

*Entosolenia marginata*, var. *quadrata*, Williamson, 1858, Rec. For. Gt. Br., p. 11, pl. i. figs. 27, 28.

Scarcely separable in point of distribution from the other varieties of *L. marginata*.

Partially carinate specimens are named *Lagena quadrata*, var. *semialata* by Messrs. Balkwill and Millett.

*Lagena bicarinata*, Terquem, sp.

*Fissurina bicarinata*, Terquem, 1882, Mém. Soc. géol. France, sér. 3, vol. ii. Mém. III. p. 31, pl. i. fig. 24.



*Lagena bicarinata*, Balkwill and Millett, 1884, Journ. Microsc. and Nat. Sci., vol. iii. p. 82, pl. iii. fig. 9.

Shore-sand, Galway (Balkwill and Millett); Irish Sea (Balkwill and Wright); south-west of Ireland (Wright);—very rare.

Trifacial specimens constitute the *Lagena trigono-bicarinata* of Messrs. Balkwill and Millett's memoir.

*Lagena orbignyana*, Seguenza, sp.

*Fissurina orbignyana*, Seguenza, 1862, Foram. Monotal. Mess., p. 66, pl. ii. figs. 25, 26.

*Entosolenia marginata* (pars), Williamson, 1858, Rec. For. Gt. Br., p. 9, pl. i. figs. 19, 20.

Common.

The trifacial form is named *Lagena trigono-marginata* by Parker and Jones, and *Lagena trigono-orbignyana* by Balkwill and Millett; and quadrifacial specimens *Lagena quadrigono-orbignyana* by the latter authors.

*Lagena castrensis*, Schwager.

*Lagena castrensis*, Schwager, 1866, Novara-Exped., geol. Theil, vol. ii. p. 208, pl. v. fig. 22.

„ „ Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science) p. 341, pl. xii. figs. 20, 21.

Off Lambay, 45 to 50 fathoms, very rare (Balkwill and Wright).

*Lagena clathrata*, Brady.

*Lagena clathrata*, Brady, 1884, Challenger Report, p. 485, pl. lx. fig. 4.

„ „ Balkwill and Millett, 1884, Journ. Microsc. and Nat. Sci., vol. iii. p. 82, pl. ii. fig. 14.

Shore-sand, Galway (Balkwill and Millett).

The same authors record quadrifacial specimens under the name of *Lagena quadrigono-clathrata*.

*Lagena pulchella*, Brady.

*Lagena pulchella*, Brady, 1866, Report Brit. Assoc., Nottingham Meeting, Trans., p. 70.

„ „ Id., 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. vi. p. 294, pl. 12, fig. 1.

Granton Harbour, Fintry Bay, Cumbrae (Brady); Oban (Robertson); shore-sand, Galway (Balkwill and Millett); Dublin coast (Balkwill and Wright).

Messrs. Balkwill and Millett have also trifacial specimens which they name *Lagena trigono-pulchella*.

*Lagena lagenoides*, Williamson, sp.

*Entosolenia marginata*, var. *lagenoides*, Williamson, 1858, Rec. For. Gt. Br., p. 11, pl. i. figs. 25, 26.

Sparsely distributed all round the coast.

Messrs. Balkwill and Wright regard the form which I have named *Lagena trigono-ornata* (Challenger Report, p. 483, pl. lxi. fig. 14), as the trifacial modification of this species. To me the 'Challenger' specimens appear to be in closer relationship with *Lagena ornata*, Will.; it is probable, however, that both varieties (if they are separable) are represented in the trifacial series.

*Lagena lagenoides*, var. *tenuistriata*, Brady.

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

„ *lagenoides*, var. *tenuistriata*, Id., 1884, Challenger Report, p. 479, pl. lx. figs. 11, 15, 16.

„ „ „ „ Balkwill and Millett, 1884, Journ. Microsc. and Nat. Sci., vol. iii. p. 82, pl. ii. fig. 12.

Shore-sand, Galway (Balkwill and Millett); occasionally met with round the Irish coast (Wright).

From the same locality the last-named authors obtained trifacial specimens which they call *Lagena trigono-tenuistriata*.

*Lagena ornata*, Williamson, sp.

*Entosolenia marginata*, var. *ornata*, Williamson, 1858, Rec. For. Gt. Br., p. 11, pl. i. fig. 24.

Whitehaven; Shetland (Williamson). This form has been so much associated with *L. lagenoides*, that it is difficult to lay down the distribution of either as distinct from the other.

*Lagena fimbriata*, Brady.

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

„ „ „ „ Balkwill and Millett, 1884, Journ. Microsc. and Nat. Sci., vol. iii. p. 82, pl. ii. fig. 5.

Shore-sand, Galway (Balkwill and Millett); south-west of Ireland, 40 to 110 fathoms (Wright).

## Sub-family 2. Nodosarinæ.

NODOSARIA, Lamarck.

*Nodosaria lævigata*, d'Orbigny.

*Nodosaria (Glandulina) lævigata*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 252, No. 1, pl. x. figs. 1-3.

*Glandulina lævigata*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 468, pl. xlvi. fig. 7.

Shetland (Waller, Brady); Cumbrae (Robertson); south-west of Ireland (Wright).

*Nodosaria rotundata*, Reuss, sp.

*Glandulina rotundata*, Reuss, 1849, Denkschr. d. k. Akad. Wiss. Wien, vol. i. p. 366, pl. xlvi. fig. 2.



*Nodosaria (Glandulina) rotundata*, Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science) p. 612.

South-west of Ireland, 79 to 120 fathoms (Wright).

*Nodosaria radricula*, Linné, sp.

*Nautilus radricula*, Linné, 1767, Syst. Nat., 12th ed., p. 1164, 285;—1788, Ibid. 13th (Gmelin's) ed., vol. i. pt. 6, p. 3373, No. 18.

*Nodosaria radricula*, Brady, 1870, Edinburgh Catalogue, p. 8.

West of Scotland (Brady); estuary of the Dee (Siddall); off the Isle of Man (Balkwill and Wright); south-west of Ireland (Wright); in all localities very rare.

*Nodosaria pyrula*, d'Orbigny.

*Nodosaria pyrula*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 253, No. 13;—Soldani, Testac., vol. ii. p. 35, pl. x. figs. b, c.

„ „ Williamson, 1858, Rec. For. Gt. Br., p. 17, pl. ii. fig. 39.

*Dentalina guttifer*, Brady, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. vi. p. 296, pl. xii. fig. 2.

Found sparingly in dredged sands from almost every part of the coast.

Curved specimens of this form have been recorded under the name of *Dentalina guttifer*.

*Nodosaria consobrina*, d'Orbigny, sp.

*Dentalina consobrina*, d'Orbigny, 1846, For. Foss. Vien., p. 46, pl. ii. figs. 1-3.

„ „ Robertson, 1875, Report Brit. Assoc., Bristol Meeting, p. 190.

Durham coast (Robertson); Irish Sea (Balkwill and Wright); south-west of Ireland (Wright).

*Nodosaria humilis*, Roemer.

*Nodosaria humilis*, Roemer, 1841, Verstein. Norddeutsch. Kreid., pt. ii. p. 95, pl. xv. fig. 6.

„ „ Siddall, 1879, Cat. Brit. Rec. For., p. 6. Shetland (Brady).

Perhaps a needless species, the specimens of which might be assigned either to *N. radricula* or to *N. (Gl.) æqualis*.

*Nodosaria communis*, d'Orbigny.

*Nodosaria (Dentalina) communis*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 254, No. 35.

*Dentalina subarcuata*, Williamson, 1858, Rec. For. Gt. Br., p. 18, pl. ii. figs. 40, 41.

Generally distributed.

Short stout specimens, with few chambers, have sometimes been separately treated under the name *Dentalina brevis*.

*Nodosaria pauperata*, d'Orbigny, sp.

*Dentalina pauperata*, d'Orbigny, 1846, For. Foss. Vien., p. 46, pl. i. figs. 57, 58.

„ „ Robertson, 1875, Report Brit. Assoc., Bristol Meeting, p. 190.

Found occasionally with the allied unornamented varieties.

*Nodosaria hispida*, d'Orbigny.

*Nodosaria hispida*, d'Orbigny, 1846, For. Foss. Vien., p. 35, pl. i. figs. 24, 25.

„ „ Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science), p. 343, pl. xii. fig. 31.

Irish Sea, off the Isle of Man (Elcock, Balkwill and Wright); estuary of the Dee (Siddall).

*Nodosaria scalaris*, Batsch, sp.

*Nautilus (Orthoceras) scalaris*, Batsch, 1791, Conchyl. des Seesandes, No. 4, pl. ii. fig. 4.

*Nodosaria radricula*, Williamson, 1858, Rec. For. Gt. Br., p. 15, pl. ii. figs. 36-38.

Generally distributed. Mr. Wright reports specimens of *N. scalaris*, var. *separans*, from south-west of Ireland, 40 to 200 fathoms.

*Nodosaria raphanus*, Linné, sp.

*Nautilus raphanus*, Linné, 1767, Syst. Nat., 12th ed., p. 1164, 283;— 1788, Ibid., 13th (Gmelin's) ed., p. 3372, No. 16.

*Dentalina subarcuata*, var. *jugosa* (pars), Williamson, 1858, Rec. For. Gt. Br., p. 20, pl. ii. fig. 43.

Shetland (Brady); south-west of Ireland, 100 to 200 fathoms (Wright).

*Nodosaria raphanistrum*, Linné, sp., has been sometimes admitted to the list of British recent species on the evidence of one of the figures in Prof. Williamson's work (Pl. ii. fig. 44). The drawing in question is from a broken specimen, and is associated by the author with two others, which are now regarded as representing *Nodosaria obliqua* and *N. raphanus* respectively. The habitat is not given, and it appears even possible that the specimen, like some other *Nodosarinæ* on the same plate, may be a derived fossil. Whilst there is this uncertainty it is evident that *N. raphanistrum* is better omitted from our list.

*Nodosaria obliqua*, Linné, sp.

*Nautilus obliquus*, Linné, 1767, Syst. Nat., 12th ed., p. 1163, 281;— 1788, Ibid., 13th (Gmelin's) ed., p. 3372, No. 14.

*Dentalina subarcuata*, var. *jugosa* (pars), Williamson, 1858, Rec. For. Gt. Br., p. 20, pl. ii. fig. 42.

„ *obliquestriata*, Robertson, 1875, Report. Brit. Assoc., Bristol Meeting, p. 190.

Widely distributed, but the number of specimens generally small. 1887.



Specimens with oblique costæ cannot be separated specifically from the straight-ribbed forms; every shade of variation in this particular is to be met with.

*Dentalina obliqua*, "d'Orbigny," is noticeable in several British lists, a perpetuation probably of an error of my own, the present form being intended. D'Orbigny's "*obliqua*" is now known under Neugeboren's name *Nodosaria (Dentalina) mucronata*, and there is no certain evidence of the occurrence of this variety on our shores.

#### LINGULINA, d'Orbigny.

##### *Lingulina carinata*, d'Orbigny.

*Lingulina carinata*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 257, No. 1;—Modèle, No. 26.

„ „ Williamson, 1858, Rec. For. Gt. Br., p. 14, pl. ii. figs. 33–35.

Shetland, Skye, Plymouth Sound (Williamson); Irish Sea (Balkwill and Wright); shore-sand, Galway (Balkwill and Millett); Killybegs Harbour (Wright).

#### VAGINULINA, d'Orbigny.

##### *Vaginulina legumen*, Linné, sp.

*Nautilus legumen*, Linné, 1758, Syst. Nat., 10th ed., p. 711, No. 248;—1767, Ibid., 12th ed., p. 1164, No. 288.

*Dentalina legumen*, Williamson, 1858, Rec. For. Gt. Br., p. 21, pl. ii. fig. 45.

Widely distributed.

##### *Vaginulina linearis*, Montagu, sp.

*Nautilus linearis*, Montagu, 1808, Test. Brit., Suppl., p. 87, pl. xxx. fig. 9.

*Dentalina legumen*, var. *linearis*, Williamson, 1858, Rec. For. Gt. Br., p. 23, pl. ii. figs. 46–48.

Widely distributed.

#### 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*, Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science) p. 344, pl. xii. figs. 17, 18.

Lambay? (Balkwill and Wright); south-west of Ireland, 100 to 200 fathoms (Wright).

#### MARGINULINA, d'Orbigny.

##### *Marginulina glabra*, d'Orbigny.

*Marginulina glabra*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 259, No. 6;—Modèle, No. 55.

*Marginulina glabra*, Brady, 1870, Ann. and Mag. Nat. Hist., ser. 4, vol. vi. p. 296, pl. xii. fig. 3.

Occasional specimens at many points both of the British and Irish coast.

*Marginulina costata*, Batsch, sp.

*Nautilus (Orthoceras) costatus*, Batsch, 1791, Conchyl. des Seesandes, p. 2, pl. 1, fig. 1.

*Marginulina raphanus*, Brady, 1866, Report Brit. Assoc., Nottingham Meeting, Trans., p. 70.

Hebrides (Brady); estuary of the Dee (Siddall); Irish Sea (Balkwill and Wright); south-west of Ireland (Wright); specimens rare and except in the last-named locality usually small.

CRISTELLARIA, Lamarck.

*Cristellaria elongata*, Williamson.

*Cristellaria subarcuatula*, var. *elongata*, Williamson, 1858, Rec. For. Gt. Br., p. 30, pl. ii. fig. 62.

*Marginulina lituus*, Parker and Jones, 1862, Carpenter's Introd. Foram., Appendix, p. 310.

Killybegs Harbour (Wright). Williamson gives no locality for his specimen.

In so far as the generic distinction is of any value, Williamson's figure is that of a *Cristellaria*, not a *Marginulina*. It differs little, if at all, from the *Cristellaria obtusata* of Reuss.

*Cristellaria crepidula*, Fichtel and Moll, sp.

*Nautilus crepidula*, Fichtel and Moll, 1803, Test. Micr., p. 107, pl. xix. figs. *g-i*.

*Cristellaria subarcuatula*, Williamson, 1858, Rec. For. Gt. Br., p. 29, pl. ii. figs. 56, 57.

Widely distributed.

*Cristellaria rotulata*, Lamarck, sp.

*Lenticulites rotulata*, Lamarck, 1804, Ann. du Muséum, vol. v. p. 188, No. 3;—Tableau Encycl. et Méth., pl. cccclxvi. fig. 5.

*Cristellaria calcar (typica)*, Williamson, 1858, Rec. For. Gt. Br., p. 27, pl. ii. figs. 52, 53.

Widely distributed.

*Cristellaria cultrata*, Montfort, sp.

*Robulus cultratus*, Montfort, 1808, Conchyl. Systém., vol. i. p. 214, 54<sup>e</sup> genre.

*Cristellaria cultrata*, Brady, 1866, Report Brit. Assoc., Nottingham Meeting, Trans., p. 70.

Carinate *Cristellariæ* are rare in the British seas. Occasional specimens are found associated with *C. rotulata*, but they are invariably small and the peripheral keel only slightly developed.

*Cristellaria vortex*, Fichtel and Moll, sp.

*Nautilus vortex*, Fichtel and Moll, 1803, Test. Micr., p. 33, pl. ii. figs. d-i.

*Cristellaria vortex*, Brady, 1870, Edinburgh Catalogue, p. 8.

Small starved specimens, doubtfully referrible to this species, from the west coast of Scotland.

*Cristellaria variabilis*, Reuss.

*Cristellaria variabilis*, Reuss, 1849, Denkschr. d. k. Akad. Wiss. Wien, vol. i. p. 369, pl. xlvi. figs. 15, 16.

„ „ Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science) p. 612.

South-west of Ireland, 100 to 200 fathoms, rare (Wright).

*Cristellaria italica*, Defrance, sp.

*Saracenaria italica*, Defrance, 1824, Dict. Sci. Nat., vol. xxxii. p. 177 ;— vol. xlvi. p. 344 ;—Atlas Conch., pl. xiii. fig. 6.

*Cristellaria subarcuatula*, var. *scapha*, Williamson, 1858, Rec. For. Gt. Br., p. 30, pl. ii. figs. 60, 61.

Estuary of the Dee, rare (Siddall). Williamson gives no locality for the broken specimen figured in his work.

## AMPHICORYNE, Schlumberger.

*Amphicoryne falx*, Jones and Parker, sp.

*Marginulina falx*, Jones and Parker, 1860, Quart. Journ. Geol. Soc., vol. xvi. p. 302, No. 28.

South-west of Ireland, 79 to 400 fathoms, rare (Wright).

## Sub-family 3. Polymorphininae.

## POLYMORPHINA, d'Orbigny.

*Polymorphina lactea*, Walker and Jacob, sp.

*Serpula lactea*, Walker and Jacob, 1798, Adams's Essays, Kanmacher's ed., p. 634, pl. xiv. fig. 4.

*Polymorphina lactea (typica)*, pars, Williamson, 1858, Rec. For. Gt. Br., p. 70, pl. vi. fig. 147.

„ „ var. *communis*, Id., Ibid., p. 72, pl. vi. figs. 153-155.

Generally distributed.

*Polymorphina gibba*, d'Orbigny.

*Polymorphina (Globulina) gibba*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 266, No. 20 ;—Modèle, No. 63.

„ „ *gibba*, Brady, 1870, Edinburgh Catalogue, p. 5.

Scarcely separable either in characters or distribution from the foregoing species. Futile attempts have been made (by myself amongst others) to distinguish the more or less compressed specimens both of



*P. lactea* and *P. gibba* by varietal names—*P. lactea*, var. *amygdaloides*, Reuss, and *P. gibba*, var. *aqualis*, d'Orbigny—respectively; but the distinction has not been found to possess the least zoological value.

*Polymorphina problema*, d'Orbigny.

*Polymorphina (Guttulina) problema*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 266, No. 14;—Modèle, No. 61.

„ „ „ *communis*, Id., Ibid., p. 266, No. 15, pl. xii. figs. 1–4;—Modèle, No. 62.

„ „ *communis*, Brady, 1870, Edinburgh Catalogue, p. 5.

Widely distributed.

It is quite impossible to separate *Polymorphina communis* from *P. problema*, and as d'Orbigny's model of the latter form presents the best developed characters, I have followed Reuss in accepting it as the type.

*Polymorphina lactea*, var. *oblonga*, Williamson.

*Polymorphina lactea*, var. *oblonga*, Williamson, 1858, Rec. For. Gt. Br., p. 71, pl. vi. figs. 149, 149a.

Widely distributed.

I have for the moment retained the trivial name "*oblonga*" just as given by Williamson, that is to say varietally. The same term had been used twice previously in connection with the genus, namely by Roemer (Neues Jahrb. für Min., &c., 1838, p. 386, pl. iii. fig. 34) and by d'Orbigny (For. Foss. Vien., p. 232, pl. xii. figs. 29–31). Roemer's specimens, so far as can be judged from his figure, may be disposed of by referring them to *P. communis* or *P. problema*; and those from the Vienna Basin might be fitly assigned to the earlier d'Orbignyan species *P. soldanii* (Ann. Sci. Nat., vol. vii. p. 265, No. 12). If this course be adopted Williamson's form, which has tolerably distinctive characters, will stand as *Polymorphina oblonga*.

*Polymorphina thouini*, d'Orbigny.

*Polymorphina thouini*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 265, No. 8;—Modèle, No. 23.

„ „ „ Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 48.

Estuary of the Dee, very rare (Siddall).

*Polymorphina lanceolata*, Reuss.

*Polymorphina lanceolata*, Reuss, 1851, Zeitschr. d. deutsch. geol. Gesell., vol. iii. p. 83, pl. vi. fig. 50.

„ „ „ *fusiformis*, pars, Brady, Parker and Jones, 1870, Trans. Linn. Soc. Lond., vol. xxvii. p. 219, pl. xxxix. fig. 5, b, c.

„ „ „ *lanceolata*, Robertson, 1882, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 268.

Robin Hood's Bay, Yorkshire; Loch Fyne (Robertson); estuary of the Dee (Siddall); Dublin coast (Balkwill and Wright); south-west of Ireland (Wright). Probably this list is far from complete.

*Polymorphina cylindroides*, Roemer.

*Polymorphina cylindroides*, Roemer, 1838, Neues Jahrb. für Min., &c., p. 385, pl. iii. fig. 26.

„ *lactea*, var. *acuminata*, Williamson, 1858, Rec. For. Gt. Br., p. 71, pl. vi. fig. 148.

Skye (Williamson); Shetland (Waller).

*Polymorphina compressa*, d'Orbigny.

*Polymorphina compressa*, d'Orbigny, 1846, For. Foss. Vien., p. 233, pl. xii. figs. 32-34.

„ *lactea (typica)*, pars, Williamson, 1858, Rec. For. Gt. Br., p. 70, pl. vi. figs. 145, 146.

Generally distributed.

*Polymorphina complanata*, d'Orbigny.

*Polymorphina complanata*, d'Orbigny, 1846, For. Fos. Vien., p. 234, pl. xiii. figs. 25-30.

„ „ Balkwill and Millett, 1884, Journ. Microsc. and Nat. Sci., vol. iii. p. 84, pl. iv. fig. 9.

Shore-sand, Galway (Balkwill and Millett).

*Polymorphina sororia*, Reuss.

*Polymorphina (Guttulina) sororia*, Reuss, 1862, Bull. Acad. Roy. Belg., sér. 2, vol. xv. p. 151, pl. ii. figs. 25-29.

„ *sororia*, Robertson, 1882, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 268.

The cuspidate variety of this form has been dredged by Mr. Robertson in Loch Fyne, and by Mr. Wright off the south-west of Ireland.

*Polymorphina rotundata*, Bornemann, sp.

*Guttulina rotundata*, Bornemann, 1855, Zeitschr. d. deutsch. geol. Gesell., vol. vii. p. 346, pl. xviii. fig. 3.

*Polymorphina rotundata*, Robertson, 1882, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 268.

Oban and Loch Fyne (Robertson); north of Ireland (Wright); Dublin coast (Balkwill and Wright).

*Polymorphina concava*, Williamson.

*Polymorphina lactea*, var. *concava*, Williamson, 1858, Rec. For. Gt. Br., p. 72, pl. vi. figs. 151, 152.

Brixham (Williamson); estuary of the Dee (Siddall); South Donegal (Wright); south-west of Ireland, 110 fathoms (Wright); Mount's Bay (Millett); Dublin coast (Balkwill and Wright).

*Polymorphina myristiformis*, Williamson.

*Polymorphina myristiformis*, Williamson, 1858, Rec. For. Gt. Br., p. 73, pl. vi. figs. 156, 157.

Widely distributed, and in certain localities very common.



*Polymorphina spinosa*, d'Orbigny, sp.

*Globulina spinosa*, d'Orbigny, 1846, For. Foss. Vien., p. 230, pl. xiii. figs. 23, 24.

*Polymorphina spinosa*, Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 48.

Estuary of the Dee, very rare (Siddall); Dublin coast, very rare (Balkwill and Wright).

UVIGERINA, d'Orbigny.

*Uvigerina pygmæa*, d'Orbigny.

*Uvigerina pygmæa*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 269, No. 2, pl. xii. figs. 8, 9;—Modèle, No. 67.

„ „ Williamson, 1858, Rec. For. Gt. Br., p. 66, pl. v. figs. 138, 139.

Not uncommon at depths of 30 fathoms and more; rarely met with in shallower water.

*Uvigerina angulosa*, Williamson.

*Uvigerina angulosa*, Williamson, 1858, Rec. For. Gt. Br., p. 67, pl. v. fig. 140.

Much more frequent in our seas than the typical form *U. pygmæa*, and occurring in shallower water.

*Uvigerina canariensis*, d'Orbigny.

*Uvigerina canariensis*, d'Orbigny, 1839, Foram. Canaries, p. 138, pl. i. figs. 25–27.

„ *irregularis*, Brady, 1865, Nat. Hist. Trans. Northd. and Durham, vol. i. p. 100, pl. xii. fig. 5.

Off Holy Island (Brady); estuary of the Dee (Siddall); south-west of Ireland (Wright); in all of these localities very rare.

SAGRINA, Parker and Jones.

*Sagrina dimorpha*, Parker and Jones.

*Uvigerina (Sagrina) dimorpha*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 420, pl. xviii. fig. 18.

Mr. Robertson has tolerably well-marked specimens of this form from low-water, Howport, Girvan.

Sub-family 4. **Ramulininæ.**

RAMULINA, Rupert Jones.

(?) *Ramulina globulifera*, Brady.

*Ramulina globulifera*, Brady, 1869, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 58, pl. viii. figs. 32, 33.

„ sp. Balkwill and Millett, 1884, Journ. Microsc. and Nat. Sci., vol. iii. p. 83, pl. iv. fig. 7.

Shore-sand, Galway (Balkwill and Millett).

I have placed the broken specimen, figured by the authors above named, provisionally under this species, but it is impossible to speak with much confidence on so slender a groundwork.

Family VIII. **GLOBIGERINIDÆ.**

**GLOBIGERINA**, d'Orbigny.

*Globigerina bulloides*, d'Orbigny.

- Globigerina bulloides*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 277, No. 1;—Modèles, No. 17 (young) and No. 76.  
 „ „ Williamson, 1858, Rec. For. Gt. Br., p. 56, pl. v. figs. 116–118.

Comparatively rare on the east coast; common at some distance from land on the Atlantic shores.

*Globigerina inflata*, d'Orbigny.

- Globigerina inflata*, d'Orbigny, 1839, Foram. Canaries, p. 134, pl. ii. figs. 7–9.  
 „ „ Wright, 1881, Proc. Belfast Nat. Field Club, 1880–81, Appendix, p. 186.

South Donegal (Wright); Irish Sea (Balkwill and Wright); south-west of Ireland (Wright); shore-sand, Galway (Balkwill and Millett); Mount's Bay, Cornwall (Millett); Shetland (Brady).

*Globigerina rubra*, d'Orbigny.

- Globigerina rubra*, d'Orbigny, 1839, Foram. Cuba, p. 94, pl. iv. figs. 12–14.  
 „ „ Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science) p. 613.

South-west of Ireland, 100 to 200 fathoms, rare (Wright).

*Globigerina æquilateralis*, Brady.

- Globigerina æquilateralis*, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 285.  
 „ „ Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science) p. 613.

South-west of Ireland, 48–120 fathoms, rare (Wright); Shetland (Brady).

**ORBULINA**, d'Orbigny.

*Orbulina universa*, d'Orbigny.

- Orbulina universa*, d'Orbigny, 1839, Foram. Cuba, p. 3, pl. i. fig. 1.  
 „ „ Williamson, 1858, Rec. For. Gt. Br., p. 2, pl. i. fig. 4.

Rare near land, but in deeper water not uncommon, especially on the south and west coasts. Shallow-water specimens often of brown colour. Double specimens, the *Globigerina bilobata* of d'Orbigny, occasionally met with where the species is plentiful.



PULLENIA, Parker and Jones.

*Pullenia sphaeroides*, d'Orbigny, sp.

*Nonionina sphaeroides*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 293, No. 1;—Modèle, No. 43.

*Pullenia sphaeroides*, Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 49.

Estuary of the Dee (Siddall); Irish Sea (Balkwill and Wright).

*Pullenia quinqueloba*, Reuss.

*Nonionina quinqueloba*, Reuss, 1851, Zeitschr. d. deutsch. geol. Gesell., vol. iii. p. 71, pl. v. fig. 31.

*Pullenia quinqueloba*, Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science) p. 348, pl. 12, figs. 29 *a*, *b*.

Lambay Deep, 45 fathoms (Balkwill and Wright); south-west of Ireland (Wright); Shetland (Brady).

SPHÆROIDINA, d'Orbigny.

*Sphæroidina bulloides*, d'Orbigny.

*Sphæroidina bulloides*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 267, No. 1;—Modèle, No. 65.

„ „ Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science) p. 613.

South-west of Ireland, 54 to 120 fathoms (Wright).

Mr. Siddall informs me that the specimen assigned to this species in the Dee Catalogue of 1878 appears to be a starved example of *Sph. dehiscens*, under which it is now placed.

*Sphæroidina dehiscens*, Parker and Jones.

*Sphæroidina dehiscens*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 369, pl. xix. fig. 5.

„ „ Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 58.

One example from the Dee estuary (Siddall).

Family IX. **ROTALIDÆ.**

Sub-family 1. **Spirillininæ.**

SPIRILLINA, Ehrenberg.

*Spirillina vivipara*, Ehrenberg.

*Spirillina vivipara*, Ehrenberg, 1841, Abhandl. k. Akad. Wiss. Berlin, p. 442, pl. iii. fig. 41.

„ *perforata*, Williamson, 1858, Rec. For. Gt. Br., p. 92, pl. vii. fig. 202.

Generally distributed; specimens, however, not very common.

*Spirillina limbata*, Brady.

*Spirillina limbata*, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 278, pl. viii. fig. 26.

*Spirillina limbata*, Siddall, 1886, Proc. Lit. Phil. Soc. Liverpool, vol. xl. Appendix, p. 59.  
Estuary of the Dee, very rare (Siddall).

*Spirillina margaritifera*, Williamson.

*Spirillina margaritifera*, Williamson, 1858, Rec. For. Gt. Br., p. 93, pl. vii. fig. 204.  
Estuary of the Dee (Siddall); Mounts Bay, Cornwall (Millett; Williamson gives no locality).

*Spirillina tuberculata*, Brady.

*Spirillina tuberculata*, Brady, 1878 (in Siddall's 'Foraminifera of the Dee'), Proc. Chester Soc. Nat. Sci., pt. ii. p. 49;—1879, Quart. Journ. Micr. Sci., vol. xix. N.S. p. 279, pl. viii. fig. 28.  
Off Eddystone (Robertson); estuary of the Dee (Siddall); at several points off the coast of Dublin, and in the Irish Sea (Balkwill and Wright).

I am not by any means confident that this form, or at any rate the British specimens that have been assigned to it, can be separated from *Sp. margaritifera*. Some of the Challenger specimens, notably those from Kerguelen, differ strikingly from Williamson's figure; but then Williamson had only a single specimen, and it may be questioned how far it was typical.

## Sub-family 2. Rotalinæ.

PATELLINA, Williamson.

*Patellina corrugata*, Williamson.

*Patellina corrugata*, Williamson, 1858, Rec. For. Gt. Br., p. 46, pl. iii. figs. 86–89.

Occurs at intervals all round the coast, usually on muddy bottoms.

DISCORBINA, Parker and Jones.

*Discorbina globularis*, d'Orbigny, sp.

*Rosalina globularis*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 271, No. 1, pl. xiii. figs. 1–4;—Modèle, No. 69.

*Rotalina concamerata* (young), Williamson, 1858, Rec. For. Gt. Br., p. 53, pl. iv. figs. 104, 105.

Common everywhere.

*Discorbina rosacea*, d'Orbigny, sp.

*Rotalia rosacea*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 273, No. 15;—Modèle, No. 39.

*Rotalina mamilla*, Williamson, 1858, Rec. For. Gt. Br., p. 54, pl. iv. figs. 109–111.

Widely distributed.

*Discorbina orbicularis*, Terquem, sp.

*Rosalina orbicularis*, Terquem, 1876, Anim. sur la Plage de Dunkerque, fasc. ii. p. 75, pl. ix. fig. 4.



*Discorbina orbicularis*, Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science) p. 349, pl. xiii. figs. 31–33.

At several points off the Dublin coast, and in the Irish Sea (Balkwill and Wright); Mount's Bay, Cornwall (Millett); shore-sand, Galway (Balkwill and Millett).

*Discorbina parisiensis*, d'Orbigny, sp.

*Rosalina parisiensis*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 271, No. 1;—Modèle, No. 38.

*Discorbina parisiensis* (pars), Wright, 1877, Proc. Belfast Nat. Field Club, 1876–7, Appendix, p. 105, pl. iv. fig. 1.

South Donegal; Down and Antrim (Wright); Dublin coast and Irish Sea (Balkwill and Wright); shore-sand, Galway (Balkwill and Millett); Mount's Bay (Millett).

*Discorbina wrightii*, Brady.

*Discorbina wrightii*, Brady, 1881, Denkschr. d. k. Akad. Wiss. Wien, vol. xliii. p. 104, pl. ii. fig. 6;—Ann. and Mag. Nat. Hist., ser. 5, vol. viii. p. 413, pl. xxi. fig. 6.

„ *parisiensis* (pars), Wright, 1877, Proc. Belfast Nat. Field Club, 1876–7, Appendix, p. 105, pl. iv. fig. 2.

Coasts of Down and Antrim, and of South Donegal (Wright); various points in the Irish Sea (Balkwill and Wright); shore-sand, Galway (Balkwill and Millett).

In Mr. Siddall's Catalogue of British Recent Foraminifera (1879), *Discorbina obtusa*, d'Orbigny, sp., was included, on the evidence of one or two small specimens, found by myself many years ago in sands dredged amongst the Hebrides; I am now inclined to think, however, that these are better referred to the present closely allied species.

*Discorbina tuberculata*, Balkwill and Wright.

*Discorbina tuberculata*, Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science) p. 350, pl. xiii. figs. 28–30.

Off Dublin coast, and in the Irish Sea (Balkwill and Wright); estuary of the Dee (Siddall).

*Discorbina bertheloti*, d'Orbigny, sp.

*Rosalina bertheloti*, d'Orbigny, 1839, Foram. Canaries, p. 135, pl. i. figs. 28–30.

*Discorbina bertheloti*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 469, pl. xlvi. fig. 10.

Shetland (Brady, Waller); various points on the coast of Ireland and in the Irish Sea (Wright, Balkwill and Wright, Balkwill and Millett).

*Discorbina biconcava*, Parker and Jones.

*Discorbina biconcava*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 422, pl. xix. fig. 10.

*Discorbina biconcava*, Siddall, 1878, Proc. Chester Soc. Nat. Sci., pt. ii. p. 50.  
Estuary of the Dee (Siddall).

PLANORBULINA, d'Orbigny.

*Planorbulina mediterranensis*, d'Orbigny.

*Planorbulina mediterranensis*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 280, No. 2, pl. xiv. figs. 4-6;—Modèle, No. 79.  
„ *vulgaris*, Williamson, 1858, Rec. For. Gt. Br., p. 57, pl. v. figs. 119, 120.

Generally distributed.

TRUNCATULINA, d'Orbigny.

*Truncatulina refulgens*, Montfort, sp.

*Cibicides refulgens*, Montfort, 1808, Conchyl. Systém., vol. i. p. 122, 31<sup>e</sup> Genre.

*Truncatulina refulgens*, Brady, 1865, Nat. Hist. Trans. Northd. and Durham, vol. i. p. 105, pl. xii. fig. 9.

Not uncommon in coarse rough sands, from 20 fathoms downwards, on the Atlantic coasts of Scotland and Ireland; rare on the east coast.

*Truncatulina lobatula*, Walker and Jacob, sp.

*Nautilus lobatulus*, Walker and Jacob, 1798, Adams's Essays, Kancher's ed., p. 642, pl. xiv. fig. 36.

*Truncatulina lobatula*, Williamson, 1858, Rec. For. Gt. Br., p. 59, pl. v. figs. 121-123.

One of the commonest British species.

Specimens closely resembling a compact many-chambered variety of *Truncatulina*, recently described by Messrs. Parker and Jones and myself in a paper on some Foraminifera from the Abrohlos Bank (Trans. Zool. Soc. Lond., vol. xii., in the press), are common in Mr. Wright's material from south-east of Ireland. This has been named *Truncatulina mundula*, and the following characters are given for its identification, *loc. cit.* Morphologically its place is near *Tr. haidingerii*, or between that species and *Tr. ungeriana*, its nearest isomorph being *Pulvinulina karsteni*.

“*Truncatulina mundula*, B. P. and J.—Test free, rotaliform; composed of about three convolutions, which are evolute on the superior and completely involute on the inferior side; the outermost whorl of the adult shell consisting of from ten to twelve segments. Superior face slightly convex or subconical, generally coarsely perforate, the sutures and periphery marked by thickening of the chamber-walls; inferior face convex, sometimes a little depressed at the umbilicus, perforations inconspicuous, sutures slightly excavated or marked by fine lines only. Diameter  $\frac{1}{60}$ th in. (0.42 mm.)” The Irish specimens have rather fewer chambers than above indicated, but otherwise present very similar characters.



*Truncatulina haidingerii*, d'Orbigny, sp.

*Rotalina haidingerii*, d'Orbigny, 1846, For. Foss. Vien., p. 154, pl. viii. figs. 7-9.

*Planorbulina haidingerii*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 469, pl. xlvi. fig. 11.

Shetland, 79 to 90 fathoms (Brady, Waller); estuary of the Dee (Siddall);—the examples, so far as they have come under my notice, not very typical.

*Truncatulina ungeriana*, d'Orbigny, sp.

*Rotalina ungeriana*, d'Orbigny, 1846, For. Foss. Vien., p. 157, pl. viii. figs. 16-18.

*Planorbulina ungeriana*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 469, pl. xlvi. fig. 12.

Shetland, 75 to 90 fathoms (Brady, Waller); estuary of the Dee (Siddall); south-west of Ireland (Wright).

ANOMALINA, d'Orbigny.

*Anomalina coronata*, Parker and Jones.

*Anomalina coronata*, Parker and Jones, 1857, Ann. and Mag. Nat. Hist., ser. 2, vol. xix. p. 294, pl. x. figs. 15, 16.

„ „ Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 469, pl. xlvi. fig. 13.

Shetland, 75 to 90 fathoms (Brady, Waller).

PULVINULINA, Parker and Jones.

*Pulvinulina repanda*, Fichtel and Moll, sp.

*Nautilus repandus*, Fichtel and Moll, 1803, Test. Micr., p. 35, pl. iii. figs. a-d.

*Rotalina concamerata* (mature), Williamson, 1858, Rec. For. Gt. Br., p. 52, pl. iv. figs. 101-103.

The typical *Pulvinulina repanda* is represented by Fichtel and Moll as a Rotaline shell with its two faces nearly equally convex. The form figured by Williamson, and generally met with on our shores, is much more convex on the superior side than on the inferior, and the sutures of the superior aspect are marked by a certain amount of external thickening or limbation. The latter form may be distinguished as var. *concamerata*, Montagu, but it is impossible to separate the two by any very constant characters.

I find no record of the occurrence of *Pulvinulina repanda* on the east coast of England or Scotland, nor in the Irish Sea. It is not uncommon in coarse sands dredged on the north and west coasts of Scotland and Ireland, and in the English Channel.

*Pulvinulina concentrica*, Parker and Jones.

*Pulvinulina concentrica*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 393.



*Pulvinulina concentrica* Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 470, pl. xlviii. fig. 14.  
Shetland, 75 to 90 fathoms (Brady, Waller).

*Pulvinulina auricula*, Fichtel and Moll, sp.

*Nautilus auricula*, var. *a*, Fichtel and Moll, 1803, Test. Micr., p. 108, pl. xx. figs. *a*, *b*, *c*.

var. *β*, Id., Ibid., figs. *d*, *e*, *f*.

*Rotalina oblonga*, Williamson, 1858, Rec. For. Gt. Br., p. 51, pl. iv. figs. 98–100.

Widely distributed.

*Pulvinulina menardii*, d'Orbigny, sp.

*Rotalia menardii*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 273, No. 26;—Modèle, No. 10.

*Pulvinulina menardii*, Brady, 1863, Report Brit. Assoc., Newcastle-upon-Tyne Meeting, Trans. p. 101.

Off Laxey, Isle of Man, 15 fathoms (Brady); Irish Sea and coast of Dublin (Balkwill and Wright).

*Pulvinulina canariensis*, d'Orbigny, sp.

*Rotalina canariensis*, d'Orbigny, 1839, Foram. Canaries, p. 130, pl. i. figs. 34–36.

*Pulvinulina canariensis*, Brady, 1870, Edinburgh Catalogue, p. 8.

Hebrides (Brady); estuary of the Dee (Siddall); shore-sand, Galway (Balkwill and Millett); south-west of Ireland (Wright).

*Pulvinulina patagonica*, d'Orbigny, sp.

*Rotalina patagonica*, d'Orbigny, 1839, Foram. Amér. Mérid., p. 36, pl. ii. figs. 6–8.

*Pulvinulina scitula*, Balkwill and Millett, 1884, Journ. Micr. and Nat. Sci., vol. iii. p. 85, pl. iv. fig. 12.

Shore-sand, Galway, a single specimen (Balkwill and Millett); south-west of Ireland, 54 to 120 fathoms, rare; off Belfast Lough, 30 to 60 fathoms, very rare (Wright).

*Pulvinulina micheliniana*, d'Orbigny, sp.

*Rotalina micheliniana*, d'Orbigny, 1840, Mém. Soc. géol. France, vol. iv. p. 31, pl. iii. figs. 1–3.

*Pulvinulina micheliniana*, Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science) p. 614.

Various points to the south-west of Ireland, 48 to 120 fathoms (Wright).

*Pulvinulina crassa* is inserted in the 'Edinburgh Catalogue' (p. 8), on the ground of one or two specimens believed to be referrible to that species obtained from Mr. Jeffreys' Hebrides dredgings. The mounting has unfortunately been mislaid, but it appears to me not improbable that the shells in question may have belonged to the present closely allied form; at any rate, without more evidence than at present exists, the retention of the name in the British list is scarcely warranted.

*Pulvinulina karsteni*, Reuss, sp.

*Rotalia karsteni*, Reuss, 1855, Zeitschr. d. deutsch. geol. Gesell., vol. vii. p. 273, pl. ix. fig. 6.

*Pulvinulina karsteni*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 470, pl. xlvi. fig. 15.

Shetland, 75 to 90 fathoms (Brady, Waller); South Donegal (Wright); Irish Sea and Dublin coast (Balkwill and Wright); south-west of Ireland, 79 to 120 fathoms (Wright).

*Pulvinulina elegans*, d'Orbigny, sp.

*Rotalia (Turbinulina) elegans*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 276, No. 54;—Soldani, Saggio Oritt., p. 99, pl. ii. fig. 13.

*Rotalina partschiana*, d'Orbigny, 1846, For. Foss. Vien., p. 153, pl. vii. figs. 28–30; pl. viii. figs. 1–3.

*Pulvinulina elegans*, Brady, 1870, Edinburgh Catalogue, p. 7.

Off Laxey, Isle of Man, 15 fathoms; Guernsey, dredged (Brady); south-west of Ireland, 48 to 120 fathoms (Wright).

ROTALIA, Lamarck.

*Rotalia beccarii*, Linné, sp.

*Nautilus beccarii*, Linné, 1767, Syst. Nat., 12th ed., p. 1162;—1788, Ibid., 13th (Gmelin's) ed., p. 3370, No. 4.

*Rotalina beccarii*, Williamson, 1858, Rec. For. Gt. Br., p. 48, pl. iv. figs. 90–92.

Generally distributed.

*Rotalia orbicularis*, d'Orbigny.

*Rotalia (Gyroidina) orbicularis*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 278, No. 1;—Modèle, No. 13.

„ *orbicularis*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 470, pl. xlvi. fig. 16.

Irish Sea; Shetland (Brady); south-west of Ireland, 100 to 200 fathoms (Wright).

*Rotalia nitida*, Williamson.

*Rotalina nitida*, Williamson, 1858, Rec. For. Gt. Br., p. 54, pl. iv. figs. 106–8.

Found at intervals all round the coast.

Sub-family 3. Tinoporinæ.

GYPSINA, Carter.

*Gypsina vesicularis*, Parker and Jones, sp.

*Orbitolina vesicularis*, Parker and Jones, 1860, Ann. and Mag. Nat. Hist., ser. 3, vol. vi. p. 31, No. 5.

*Tinoporus lævis*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 470, pl. xlvi. fig. 17.

Not uncommon on the Atlantic sea-board and in the Irish Sea; not recorded from the east coast of England or Scotland.



*Gypsina globulus*, Reuss, sp.

*Ceriodora globulus*, Reuss, 1847, Haidinger's Naturw. Abhandl., vol. ii. p. 33, pl. v. fig. 7.

*Gypsina globulus*, Wright, 1886, Proc. R. Irish Acad., ser. 2, vol. iv. (Science) p. 614.

A single large specimen reported by Wright from 110 fathoms, south-west of Ireland.

*Gypsina inhærens*, Schultze, sp.

*Acervulina inhærens*, Schultze, 1854, Organ. der Polythal., p. 68, pl. vi. fig. 12.

*Tinoporos lucidus*, Brady, 1870, Edinburgh Catalogue, p. 8.  
Generally distributed.

## Family X. NUMMULINIDÆ.

## Sub-family 1. Fusulininæ.

## Sub-family 2. Polystomellinæ.

## NONIONINA, d'Orbigny.

*Nonionina asterizans*, Fichtel and Moll.

*Nautilus asterizans*, Fichtel and Moll, 1803, Test. Micr., p. 37, pl. iii. figs. e-h.

*Nonionina asterizans*, Brady, 1870, Edinburgh Catalogue, p. 8.

Since becoming better acquainted with the typical *Nonionina asterizans*, through the 'Challenger' collections, I have had considerable doubt whether the species has any claim to a place in the British list. The British specimens which have come under my notice have all been minute, and their characters ambiguous; and I am inclined to think they might generally be referred either to *N. depressula* on the one hand, or *N. stelligera* on the other. Of the distribution of *N. asterizans* as distinct from these two forms there is no satisfactory information.

*Nonionina depressula*, Walker and Jacob, sp.

*Nautilus depressulus*, Walker and Jacob, 1798, Adams's Essays, Kämpfer's ed., p. 641, pl. xiv. fig. 33.

*Nonionina umbilicatula*, Williamson, 1858, Rec. For. Gt. Br., p. 97, pl. iii. figs. 70, 71.

„ *crassula*, Id., Ibid., p. 33.

Generally distributed; one of the commonest Microzoa of shallow pools and estuaries, and of brackish water.

*Nonionina umbilicatula*, Montagu, sp.

*Nautilus umbilicatus*, Montagu, 1803, Test. Brit., p. 191;—Suppl., p. 78, pl. xviii. fig. 1.

*Nonionina barleeana*, Williamson, 1858, Rec. For. Gt. Br., p. 32, pl. iii. figs. 68, 69.

Widely distributed; affecting much deeper water than the last-named species.



*Nonionina orbicularis*, Brady.

*Nonionina orbicularis*, Brady, 1881, Denkschr. d. k. Akad. Wiss. Wien, vol. xliii. p. 105, pl. ii. fig. 5;—Ann. and Mag. Nat. Hist., ser. 5, vol. viii. p. 415, pl. xxi. fig. 5.

„ „ Robertson, 1882, Proc. Nat. Hist. Soc. Glasgow, vol. v. p. 274.

Loch Fyne, 25 fathoms (Robertson); off Valentia, 112 fathoms (Norman); south-west of Ireland, 79 to 120 fathoms (Wright).

*Nonionina boueana*, d'Orbigny.

*Nonionina boueana*, d'Orbigny, 1846, For. Foss. Vien., p. 108, pl. v. figs. 11, 12.

„ „ Balkwill and Millett, 1884, Journ. Micr. and Nat. Sci., vol. iii. p. 85.

Shore-sand Galway? (Balkwill and Millett).

This is not a very satisfactory "species" at best. The shell figured by Messrs. Balkwill and Wright (Trans. R. Irish Acad., vol. xxviii. (Science) pl. xiii. fig. 27) shows the double rows of sutural orifices characteristic of *Polystomella arctica*, and I learn that the authors are now disposed to transfer it to that species. The right of *Nonionina boueana* therefore to a place in the present list depends upon Messrs. Balkwill and Millett's doubtful specimens.

*Nonionina pauperata*, Balkwill and Wright.

*Nonionina pauperata*, Balkwill and Wright, 1885, Trans. R. Irish Acad., vol. xxviii. (Science) p. 353, p. xiii. figs. 25, 26.

Dublin coast, and various points in the Irish Sea, rather frequent (Balkwill and Wright); south-west of Ireland, 26 fathoms (Wright).

Possibly only the starved condition of *Nonionina scapha*.

*Nonionina turgida*, Williamson, sp.

*Rotalina turgida*, Williamson, 1858, Rec. For. Gt. Br., p. 50, pl. iv. figs. 95-97.

Tolerably frequent all round the coast.

*Nonionina scapha*, Fichtel and Moll, sp.

*Nautilus scapha*, Fichtel and Moll, 1803, Test. Micr., p. 105, pl. xix. figs. d-f.

*Nonionina scapha*, Brady, 1865, Nat. Hist. Trans. Northd. and Durham, vol. i. p. 106, pl. xii. fig. 10.

Durham coast (Brady); west of Scotland (Robertson); estuary of the Dee (Siddall); shore-sand, Galway? (Balkwill and Millett); coast of Down and Antrim; south-west of Ireland, 40 to 120 fathoms (Wright).

*Nonionina stelligera*, d'Orbigny.

*Nonionina stelligera*, d'Orbigny, 1839, Foram. Canaries, p. 128, pl. iii. figs. 1, 2.

*Nonionina stelligera*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 471, pl. xlviii. fig. 19.

Shetland, 80 fathoms (Brady, Waller); estuary of the Dee (Siddall); Mount's Bay (Millett); shore-sand, Galway (Balkwill and Millett); Dublin Bay and Irish Sea (Balkwill and Wright); south-west of Ireland (Wright).

POLYSTOMELLA, Lamarck.

*Polystomella crispa*, Linné, sp.

*Nautilus crispus*, Linné, 1767, Syst. Nat., 12th ed., p. 1162, 275;—1788, Ibid., 13th (Gmelin's) ed., p. 3370, No. 3.

*Polystomella crispa*, Williamson, 1858, Rec. For. Gt. Br., p. 40, pl. iii. figs. 78–80.

Common at all parts of the coast.

*Polystomella subnodosa*, Münster, sp.

*Robulina subnodosa*, Münster, 1838 (*fide* Roemer), Neues Jahrb. für Min. &c., p. 391, pl. iii. fig. 61.

*Polystomella subnodosa*, Wright, 1886, Proc. R. Irish Acad., ser. 2 vol. iv. (Science) p. 614.

South-west of Ireland, 100 to 120 fathoms, frequent (Wright).

*Polystomella striatopunctata*, Fichtel and Moll, sp.

*Nautilus striatopunctatus*, Fichtel and Moll, 1803, Test. Micr., p. 61, pl. ix. fig. a-c.

*Polystomella umbilicatula*, Williamson, 1858, Rec. For. Gt. Br., p. 42, pl. iii. figs. 81, 82.

„ „ var. *incerta*, Id., Ibid., p. 44, pl. iii. fig. 82 a.  
Generally distributed.

*Polystomella arctica*, Parker and Jones.

*Polystomella crispa*, var. *arctica*, Parker and Jones, 1865, Phil. Trans., vol. clv. p. 401, pl. xiv. figs. 25–30.

„ *arctica*, Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv. p. 471, pl. xlviii. fig. 18.

Shetland, 75 to 90 fathoms (Brady, Waller); between Portincross and Ardrossan, 30 fathoms (Robertson); Kish Bank, 24 fathoms, very rare (Balkwill and Wright—described and figured as *Nonionina boueana* in their memoir).

Sub-family 3. Nummulitinæ.

OPERCULINA, d'Orbigny.

*Operculina ammonoides*, Gronovius, sp.

*Nautilus ammonoides*, Gronovius, 1781, Zooph. Gron., p. 282, No. 1220; and p. v.

*Nonionina elegans*, Williamson, 1858, Rec. For. Gt. Br., p. 35, pl. iii. figs. 74, 75.

Shetland, Hebrides (Williamson, Brady, Waller); Scarborough (Williamson); south-west of Ireland (Wright).

POSTSCRIPT.—Since the foregoing Synopsis has been in type I have received from my friend M. Schlumberger a copy of a valuable communication, recently made by him to the Zoological Society of France, on the genus *Planispirina* (Bull. Soc. Zool. France, vol. xii. pp. 105–118, pl. vii.), containing a further instalment of his interesting researches on the construction of the test in the various types of *Miliolidaë*. M. Schlumberger's examination of the forms referred to the genus *Planispirina* in the 'Challenger Report' has led him to the conclusion that they exemplify two diverse types of structure sufficiently distinct for generic separation,—one group, for which the term *Planispirina* is retained, embracing *Pl. (Biloculina) contraria*, d'Orb., *Pl. communis*, Seg., and *Pl. carinata*, Seg. (and, I suppose, *Pl. exigua*, Brady); the other, for which the generic name *Sigmoilina* is proposed, including *Planispirina sigmoidea*, Brady, *Pl. (Spiroloculina) celata*, Costa, and a new species *Sigmoilina edwardsi*, Schlumberger, together with *Quinqueloculina secans*, d'Orb., and *Quinqueloculina tenuis*, Czjzek.

It is not needful here to discuss the relative value of the characters upon which this arrangement is founded. The construction of the test in the species concerned has been worked out with the author's accustomed skill and accuracy, and so far as can be judged the results bear out the conclusions at which he has arrived. That the difficulties referred to on a previous page, as to the position of apparently intermediate forms, like *Quinqueloculina tenuis* and *Q. secans*, are thereby disposed of, is an additional argument in favour of the suggested relationship.

The acceptance of this view would only affect the nomenclature of the present paper in connection with three species, namely,—*Planispirina celata*, *Miliolina secans*, and *Miliolina tenuis*, which would stand respectively as *Sigmoilina celata*, Costa, sp., *Sigmoilina secans*, d'Orb., sp., and *Sigmoilina tenuis*, Czjzek, sp.

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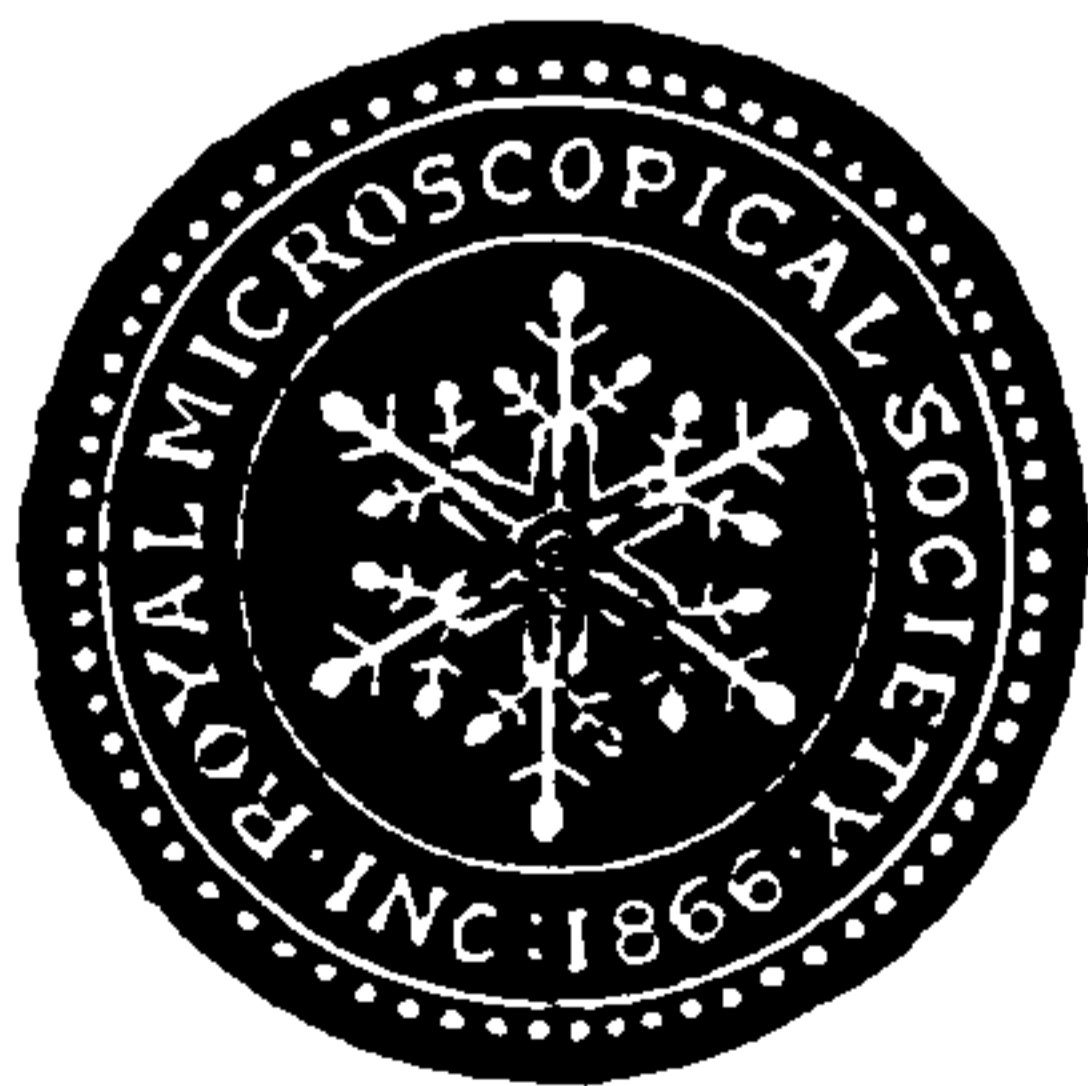
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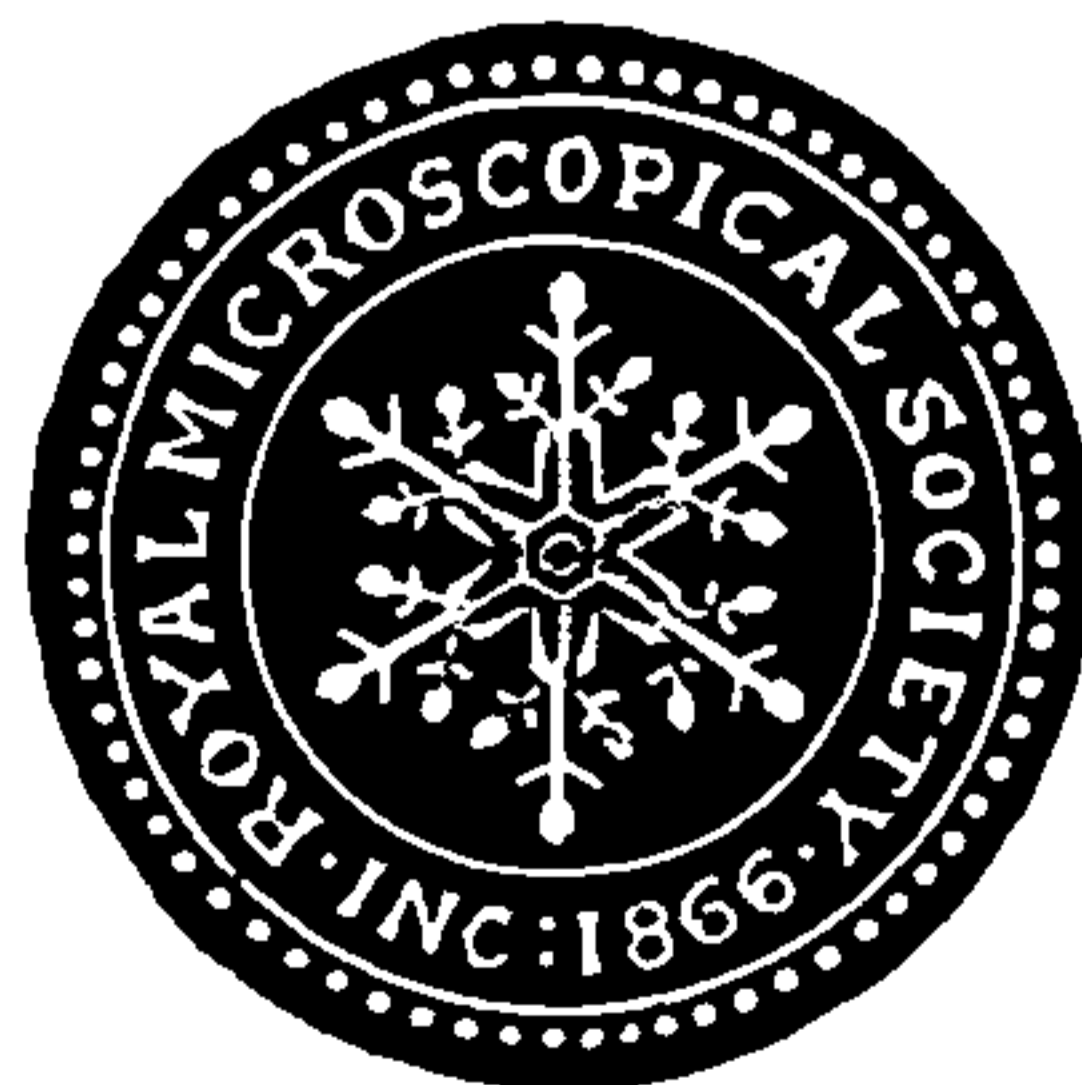
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